THE CONCEPTUALISATION, SENSITIVITY AND MEASUREMENT OF HOLDING COSTS AND OTHER SELECTED ELEMENTS IMPACTING HOUSING AFFORDABILITY

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Literature Review and Research Methodology
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Abstract

It is widely held that strong relationships exist between housing, economic status, and well being. This is exemplified by widespread housing stock surpluses in many countries which threaten to destabilise numerous aspects related to individuals and community. However, the position of housing demand and supply is not consistent. The Australian position provides a distinct contrast whereby seemingly inexorable housing demand generally remains a critical issue affecting the socio-economic landscape. Underpinned by high levels of immigration, and further buoyed by sustained historically low interest rates, increasing income levels, and increased government assistance for first home buyers, this strong housing demand ensures elements related to housing affordability continue to gain prominence. A significant, but less visible factor impacting housing affordability – particularly new housing development – relates to holding costs. These costs are in many ways "hidden" and cannot always be easily identified. Although it is only one contributor, the nature and extent of its impact requires elucidation. In its simplest form, it commences with a calculation of the interest or opportunity cost of land holding. However, there is significantly more complexity for major new developments - particularly greenfield property development. Preliminary analysis conducted by the author suggests that even small shifts in primary factors impacting holding costs can appreciably affect housing affordability – and notably, to a greater extent than commonly held. Even so, their importance and perceived high level impact can be gauged from the unprecedented level of attention policy makers have given them over recent years. This may be evidenced by the embedding of specific strategies to address burgeoning holding costs (and particularly those cost savings associated with streamlining regulatory assessment) within statutory instruments such as the Queensland Housing Affordability Strategy, and the South East Queensland Regional Plan. However, several key issues require investigation. Firstly, the computation and methodology behind the calculation of holding costs varies widely. In fact, it is not only variable, but in some instances completely ignored. Secondly, some ambiguity exists in terms of the inclusion of various elements of holding costs, thereby affecting the assessment of their relative contribution. Perhaps this may in part be explained by

their nature: such costs are not always immediately apparent. Some forms of holding costs are not as visible as the more tangible cost items associated with greenfield development such as regulatory fees, government taxes, acquisition costs, selling fees, commissions and others. Holding costs are also more difficult to evaluate since for the most part they must be ultimately assessed over time in an ever-changing environment, based on their strong relationship with opportunity cost which is in turn dependant, inter alia, upon prevailing inflation and / or interest rates. By extending research in the general area of housing affordability, this thesis seeks to provide a more detailed investigation of those elements related to holding costs, and in so doing determine the size of their impact specifically on the end user. This will involve the development of soundly based economic and econometric models which seek to clarify the componentry impacts of holding costs. Ultimately, there are significant policy implications in relation to the framework used in Australian jurisdictions that promote, retain, or otherwise maximise, the opportunities for affordable housing.

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List of Abbreviations & Acronyms

AHURI	Australian Housing and Urban Research Institute
ALGA	Australian Local Government Association
EOQ	Economic Order Quantity (inventory management model)
EPAA	Environmental Planning and Assessment Act
ERA	Excellence in Research for Australia initiative
GFC	Global Financial Crisis
GST	Goods and Services Tax
HIA	Housing Industry Association Ltd, Australia
HPLGM	Housing, Planning and Local Government Ministers
LGA	Local Government Area
NHS	National Housing Strategy
NHSC	National Housing Supply Council (Australia)
NSW	New South Wales
PCA	Property Council of Australia
PIA	Planning Institute of Australia
PIP	Priority Infrastructure Plans (Queensland)
RDC	Residential Development Council
QHAS	Queensland Housing Affordability Strategy
QLD	Queensland
SEQERP	South East Queensland Regional Plan
UDIA	Urban Development Institute of Australia
ULDA	Urban Land Development Authority (Queensland)
UK	United Kingdom
US	United States

Statement of Original Authorship

The work contained in this Confirmation of Candidature documentation has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: 

Date: 10 May 2010

Chapter 1: Introduction

This chapter outlines the background (section 1.1) and context (section 1.2) of the research, and its purposes (section 1.3). Section 1.4 describes the significance and scope of this research and provides definitions of terms used. Finally, section 1.5 includes an outline of the remaining chapters of the thesis.

By way of general overview, the main objective of this program of research is to ultimately develop a model that enables the quantification of the impact of holding costs and related elements on housing affordability in Australia. Understanding the various components of holding costs over time, in the context of greenfield residential development, is fundamental to this process.

Across this research process it is intended to establish various linkages with other related aspects. Aside from obvious linkages such as interest rates and inflation, it will also establish the extent of linkages with other less visible components such as the length of regulatory assessment periods, and the impact of various planning instruments.

1.1 BACKGROUND

The author's current main research interests and involvement include:

1. Displacement of industries, and industry change, in rural areas
2. Population demographic analysis, particularly older age cohorts / rural exodus
3. Large scale ("state significant") projects
4. Rural valuation practice & methodologies
5. Housing affordability

The last research topic mentioned above (5) is a matter of significant current social concern, and an investigation into aspects of this appears a worthy undertaking based on its apparent obtrusiveness into mainstream Australian society. This has been the primary motivation behind selecting the research program for this dissertation.

Housing affordability issues are gaining increasing prominence in the Australian socio-economic landscape, despite strong economic growth and prosperity and manoeuvring through the recent Global Financial Crisis (GFC). Its importance has captured the attention of the wider population, with the issue ranking highly across the broader political agenda. The need to provide affordable housing to meet the expectations of burgeoning populations, particularly young people, first home owners and the socially disadvantaged, is fundamental to maintaining stability of families and households and supporting an acceptable standard of living. Aside from maintaining essential structures that support social networks, there are many other reasons that lie behind addressing the issue. It is, for example, widely acknowledged as a major consideration for any new development, playing a major role in fostering industry and employment.

Although there is a considerable body of literature evolving in relation to welfare aspects, and various theories and concepts related to housing affordability, there has been limited work completed on the delivery side of the equation. This is of particular interest given the volatility of property markets, where the expectations of property developers, and property owners, do not always align very easily. The determination of aspects related to this may prove enlightening – i.e. which, if any, are real, and which, if any, are just perceptions?

1.2 CONTEXT – RESEARCH PROBLEM

The issue of housing affordability is multi-dimensional. The growing body of literature on the subject has identified many factors associated with housing affordability. These include macro structural / micro-behavioural variables such as interest rates, construction cost, income levels, buyer's decision, intentions, land supply, housing prices, and a range of other factors. The matter has many facets, is complex, and interwoven.

In terms of this study, it is significant that one factor that has been widely held to impact housing affordability is that of holding costs. Although only one contributor to the problem of housing affordability, the scope and nature of its impact requires clarification. Although related to land banking behaviour often exercised by

both the public and private sector, it is much more multifarious than simple calculation of the interest cost, or opportunity cost, of long term land holding.

1.3 PURPOSES – AIMS AND OBJECTIVES

In looking at the impact of development holding costs on housing affordability, this research is intended establish whether its contribution may be of greater significance than currently held - especially where the time taken for regulatory assessment is excessive. Therefore, the aims and objectives for this research are identified as follows:

1. To establish the nature and composition of holding costs over time, as related to residential property in Australia, and internationally.
2. To examine the linkages that may exist between various planning instruments, the length of regulatory assessment periods, and housing affordability.
3. To develop a model that quantifies the impact of holding costs on housing affordability in Australia, with a particular focus on the consequences of extended assessment periods as a component of holding costs. Thus, provide clarification as to the impact of holding costs on overall housing affordability.

There are potentially a multitude of significant costs associated with "holding" that inevitably act to drive up prices, and therefore impact housing affordability. These costs cannot always be easily identified, however it can be said that ultimately the real impact is felt by those whom can least afford it - new home buyers whom obtain finance: their mortgage repayments can be relatively easily pushed into the realms of un-affordability.

1.4 SIGNIFICANCE, SCOPE AND DEFINITIONS

The Queensland Housing Affordability Strategy calculates that development holding costs typically add at least $15,000 to $20,000 per dwelling, for greenfield developments. These costs are generally acknowledged to be simply passed on by the developer, and are reflected in purchase prices paid. This research investigates the possibility that the amount is likely to be of greater significance especially where time taken for regulatory assessment is excessive. The hypothesis tested is that even

small shifts in assessment period can significantly affect housing affordability – to a much greater extent than widely thought. The importance of this emphasises a number of aspects such as the impact of land banking behaviour by developers, and other aspects such as the need for timely processing of development applications by regulatory authorities.

This research also considers all the market and non-market variables likely to impact housing affordability, in the context of holding costs detail. As housing affordability matters have both space and time variance, this study suggests that research undertaken might incorporate a breaking down of the analysis, ideally by regions in Australia, over time. This could be compared to an international comparison study that confirms the extent and variability of regulatory assessment periods in Australia and elsewhere. Together with the foregoing, this will lead to the development of an econometric model clarifying whether the length of regulatory assessment period impacts holding costs, and, as a result, whether it can be established that the assessment period impacts housing affordability. This has significant policy implications for changing the framework used in Australian jurisdictions that might result in promoting or retaining affordable housing, or otherwise maximise the opportunities for affordable housing.

1.5 RESEARCH QUESTIONS

Chapters for the remainder of this thesis will be based around the following research questions:

1. What is the nature and composition of holding costs applying in Australian and international residential property markets? Is the matrix relatively static, or changing over time?
2. In relation to property, and property (residential real estate) development, what are the prevailing planning and statutory regulations utilised in Australia and internationally? Which (if any) of these instruments are used to support affordable housing concepts, and which (if any) of these instruments represent part of the holding cost matrix? In the context of housing affordability, has any public or private planning tool been

identified in the literature as being more effective, or more destructive, than any other?

3. What is the extent and variability of regulatory assessment periods in Australia and internationally? Does the length of the regulatory assessment period impact holding costs?

4. As a result of the above, can it be established that the assessment period is a contributor impacting housing affordability? To what extent, and what are the linkages? What are the policy implications, e.g. does the evidence exist to demonstrate that changes to the framework used in Australian or overseas jurisdictions might result in promoting or retaining affordable housing?

5. Can a model be developed in the light of the foregoing to quantify the impacts of holding costs, focussing on the timing of assessment periods, in relation to housing affordability - or otherwise maximise the opportunities for affordable housing?

Chapter 2: Literature Review

This chapter begins with a historical background (section 2.1) which sets the scene in terms of the broad housing affordability research agenda, leading to an overview of holding costs role in the determination of property value. It then proceeds to provide reviews of literature on the following topics:

Section 2.2 The Issue of Housing Affordability - in this section the meaning and significance of housing affordability is described, with relationships examined pertaining to demand and time, along with measurement methods employed as found the literature.

Section 2.3 Holding & Opportunity Cost Theory in a Property Development Context – with an evolution stemming from inventory management EOQ models, the nature and composition of holding costs are explored together with an investigation related to the complexities in the treatment and calculation. This section pays special attention to the ambiguities present in the literature, particularly with regards the latter investigation.

Section 2.4 highlights the implications from the literature and develops the conceptual framework for the study.

2.1 HISTORICAL BACKGROUND

2.1.1 COMPATIBILITY WITH OTHER KEY HOUSING AFFORDABILITY RESEARCH AGENDAS

In order to achieve genuine improvements in housing affordability outcomes, including the development of appropriate policy responses across housing, planning, taxation and other portfolios, it would seem prudent for government to have a deep appreciation of the range of factors shaping the supply of affordable housing.

The current research agenda held broadly across the research community is typified by a response to housing affordability concerns that currently have a particularly high priority on the political schema. For example, the Australian Housing and Urban Research Institute (AHURI) Research Agenda 2008 describes one of their targeted areas of research for 2008 (section 4) being the supply of

affordable housing (*AHURI Research Agenda 2008*, 2007). It has a policy research aim to *"understand how governments use housing assistance and other policy levers to increase the supply of affordable housing"*. This national research organisation (comprised of seven participating Research Centres involving 12 universities) throughout Australia specialises in housing and urban research and policy and is primarily involved in the creation and dissemination of knowledge in housing markets, housing policy and programs, and the urban environment in cities, towns and regions. They are therefore well placed to determine where the knowledge gaps are. Such research questions fundamentally include examination of government low-income home ownership support programs and the forms government action and subsidy that could most effectively support low-income households' access to and maintenance of home ownership. In addition, it is worthwhile considering how changing supply side conditions, particularly land supply, may have affected house prices.

This research complements such agendas by looking at aspects of housing affordability not currently addressed, i.e. the impact of holding costs, including timeliness in regulatory assessment. It is designed to assist in clarifying, inert alia, the impact of government regulations on house prices.

2.1.2 HOLDING COSTS – A MAJOR DETERMINATE OF VALUE

The economic evaluation of land development projects, like many other kinds of projects, is typically undertaken by using different measures of value based on discounted cash flows. Therefore, the element of time is a critical determinant of viability since the discount applied to any project is always based on discount over time. As pointed out in a recent Urbis report (Walker et al., 2008), like all industries, time is of the essence to the land development business. Since time is critical, it is apparent that if a project takes longer to come to realisation, for any reason, then the costs of that project will increase. In the case of a property development project, costs relating to that portion of time when a project is held up are generally regarded as "holding costs".

Holding costs can take many forms, but they inevitably involve the computation of "carrying costs" of an initial outlay that has yet to fully realise its

ultimate yield. Although sometimes considered a "hidden" cost, it is submitted that holding costs prospectively represent a major determinate of value. If this is the case, then considered in the context of housing affordability, it is therefore potentially pervasive.

This research focuses on the varying approaches and methodologies adopted when the calculation of holding costs is undertaken, focussing on greenfield development. Whilst acknowledging there may be some consistency in embracing first principles relating to holding cost theory, a review of the literature reveals considerable lack of uniformity in this regard. There is even less clarity in quantitative determination, especially in Australia where there has been only limited empirical analysis undertaken. Despite a growing quantum of research undertaken in relation to various elements connected with housing affordability, the matter of holding costs has not been well addressed regardless of its part in the highly prioritised Australian Government's housing research agenda. The end result has been a modicum of qualitative commentary relating to holding costs. There have been few attempts at finer-tuned analysis that exposes a quantified level of holding cost calculated with underlying rigour.

2.2 THE ISSUE OF HOUSING AFFORDABILITY

2.2.1 THE DEFINITION & SIGNIFICANCE OF HOUSING AFFORDABILITY

The notion of affordability relates strongly to the availability of housing which has been demonstrated to have significance influence on, and a significant driver of, life fulfilment and quality of life (Garner, G., 2006). The availability of affordable housing has been described as being central support to a decent life - entailing the maintenance of stable households connected to the main institutions in our society – jobs, services, family and social networks (Berry, Mike, 2002a).

Recognition of its significance in an Australian context can in fact be traced back several decades. According to a AHURI[1] report (Gabriel et al., 2005), in

[1] Australian Housing & Urban Research Institute

Australia, affordability emerged as part of the policy language in the 1980s as a response to mortgage interest rates of the order of 17 per cent and a housing price boom, and to policy reports such as the National Housing Policy Review and, later, the National Housing Strategy. As has been espoused (Berry, Mike et al., 2004), housing is and will always be a central concern of good government, especially with increasing disparities in incomes and housing costs. Over the last few years, it has re-emerged, again as a consequence of rising house prices placing pressure on lower income households and, increasingly, middle income households seeking to purchase their first home. The escalating nature of this problem has been noted (Burke et al., 2007), since when housing costs in relation to income increase, problems associated with poor affordability typically become more accentuated. This observation is supported by findings recording that "*where over 50 per cent of income is going towards housing costs, many renters are adopting practices that are arguably unacceptable in an affluent society"*. Gabriel also comments that while first home ownership and rising costs have been addressed in Productivity Commission reports, there is now a concern by many policy makers to widen this debate about affordability to consider the implications of rising house prices in the context of a declining public rental stock.

The definition of and benchmarks relating to housing stress vary across policy environments (Berry, Mike et al., 2004). Whilst affordable housing is defined differently across the various policy, planning, program and research contexts in which the term is used, the following definition may hold a common thread for many: *"Affordable housing is housing which is affordable for low and moderate income households across home ownership, private rental as well as public rental tenures"* HPLGM 2005, p.1 (Gurran et al., 2007). This definition has been adopted by the Housing, Planning and Local Government Ministers in developing the Framework for National Action on Affordable Housing.

"Affordable housing" therefore refers to new and existing dwellings consumed by low to-moderate income households across all the main housing tenure categories, without suffering housing stress. Regardless of definition, it is hard to escape what is seen a fact by many – that is, the declining housing affordability faced by many Australians, even after a decade of strong economic growth (Berry, Mike, 2002b). Berry further suggests that the debate in Australia over 'affordable housing' was

strongly boosted in the early 1990s by the first publications of the Commonwealth Government's National Housing Strategy (NHS). This approach defined the matter as follows: *the term 'affordable' housing conveys the notion of reasonable housing costs in relation to income: that is, housing costs that leave households with sufficient income to meet other basic needs such as food, clothing, transport, medical care and education* (NHS, 1991, p. ix).

In reviewing international evidence, it might also be seen that there are striking parallels in the economic and demographic circumstances that are said to be driving recent problems of housing affordability: namely, the global rise in property prices over the past decade and, in particular, the stronger appreciation of housing prices in the inner urban precincts of larger metropolitan areas (Katz et al. 2003), (Gabriel et al., 2005).

2.2.2 RELATIONSHIP BETWEEN HOUSING AFFORDABILITY & DEMAND

The Australian housing market represents a classic example of the economic model of supply and demand. Over the last decade or so there has been a sustained increase in demand for housing which has been maintained by:

- relatively low interest rates, coupled with increased competition between home lenders making financing easier to obtain
- increasing real household incomes
- schemes designed, or public policy that has the effect of encouraging and supporting new home buyers, particularly first home buyers (many of these buyers are new entrants to the market, especially in Queensland and Western Australia where net immigration levels are relatively high)
- increased relative attractiveness of real estate property as an investment

The literature establishes strong links between population, housing demand, commerce industry and employment. All these factors in turn relate strongly to the issue of housing affordability. The traditional supply / demand curve has a few nuances however when related to real estate. For example, in the case of property, it may be seen that whilst outward shifts in the demand curve causes price increases, the ability of supply to respond quickly is limited since it takes time to develop land

for housing and to construct houses. However, whilst such an outward shift in the demand curve would cause an expected increase in prices, the ability of supply to respond quickly is limited since it takes time to develop land for housing and to construct houses. The short term elasticity of supply of housing is low (Sloman & Norris, 2006). This could explain why between 1996 and 2003 real house prices increased by no less than 70%, and about half the increase occurred in 2002/03.

This general principle of demand is commonly held by property economics commentators. The age, size, income and other characteristics of households also require consideration in order to determine demand for housing (Reed, 2007), with demand for commercial and industrial property created by a population's demand for the goods and services to be produced or distributed at these sites. As a consequence, a strong link is established between population, housing demand, commerce industry and employment. All these factors in turn relate strongly to the issue of housing affordability.

Social Dynamics

The demand / supply equation must also take into account the aspect of human nature itself. We are reminded of this in a recent study which suggests that housing prices are *"better explained in terms of human behaviour and social changes than by mere trend analysis"* (Small, 2009). The implication that there are strong connections between social dynamics of the household and economic behaviour further complicates the housing affordability equation. This appears to have been recognised by other commentators determining that household lifecycles and behaviour are strongly relevant factors in relation to housing affordability. For example a recent AHURI report (Wood & Ong, 2009a) found that residential moves made by households during a spell living in affordable housing are associated with the onset of housing affordability stress because these moves tend to involve trading up in the housing market. This latter report also found that precarious housing affordability circumstances are particularly evident among younger couples with dependent children, a stage in the life cycle that is associated with pressing spending needs.

2.2.3 RELATIONSHIP BETWEEN HOUSING AFFORDABILITY & TIME

Housing affordability is also impacted by the passage of time. This especially relates to the time taken by regulators to provide input and make decisions on projects once a financial commitment has been made by a project's proponent. This is more generally included in the calculation of holding costs by developers, a cost which is inevitably passed on to end-purchasers.

The extent to which this impacts a project varies considerably, however it is interesting to note the comment made by the ALGA[2] President that *"…I do have concerns about some state processes. State planning is too slow and does not allow councils to get on with the development of housing developments and the associated social infrastructure. This just encourages fly-in/fly-out arrangements which are anathema to the establishment of local communities"* (Bell, 2007). The speed at which Infrastructure and services are implemented, which is often driven as much by planning processes as it is by economics, is strongly linked with the costs of development and ultimately, housing affordability. Affordability problems are also thought to be driven primarily by low incomes rather than occupation per se (Yates et al., 2006a).

Although some variation exists as to the extent and impact, most housing researchers would agree with Hall whom concludes that housing affordability problems have been clearly established; intensifying significantly in Australia over the past 15 years (Hall et al., 2003). Housing Affordability is a key research theme and there is currently a good deal of interest being shown in this area, possibly – or at least in part - due to broad-base political agendas. Organisations such as AHURI are particularly concerned as to how government planning processes might be impacting this. For example, some researchers (Randolph, 2007) are currently looking at the cost effect of planning regulations and charges on house prices and affordability in Australia. This project will attempt to quantify the cumulative cost impacts of State and local government regulations and charges, and evaluate the cost impacts of existing and proposed regulation on housing production against the explicit

[2] Australian Local Government Association – Cr Paul Bell, ALGA President

objectives of the regulation, as a basis for avoiding unnecessary or unjustifiable regulation and for offsetting unavoidable affordability impacts. Another example is an investigation into International housing trends and policy responses (Milligan, Vivienne, 2007) whom is investigating, inter-alia, the use of planning mechanisms to improve the supply of affordable housing in growth areas, building on comparative research already funded by AHURI in order to broaden the focus to a wider range of national policies.

2.2.4 MEASUREMENT OF HOUSING AFFORDABILITY IN AUSTRALIA

The notion of affordability is tightly embraced throughout Australia – typically achieved through statutory or "quasi-statutory" means. For example, in south-east Queensland this is accomplished primarily through adoption of SEQRP Regional Policy which incorporates *"the provision of affordable (low cost and potentially social) housing in major new developments or redevelopments"* (*South East Queensland Regional Plan 2005-2026*, 2005). However, despite the existence of some commonly known benchmarks, there are wide disparities in measurement methods.

Challenges in the Measurement of Housing Affordability in Australia

The extent of the housing affordability problem in Australia has been recently highlighted by a number of Industry Reports, perhaps one of the most publicised being the Annual Demographia International Housing Affordability Surveys (Cox & Pavletich, 2006, 2007, 2009, 2010). These surveys employ the "Median House Price to Median Household Income Multiple," ("Median Multiple") to rate housing affordability. The Demographia Housing Affordability Ratings categorise Median Multiples from "Affordable" at 3.0 or Less, to "Severely Unaffordable" at 5.1 & over.

The Demographia Report comments that in recent decades, the Median Multiple has been proven remarkably similar among the nations surveyed, with median house prices being generally 3.0 or less times median household incomes. This historic affordability relationship has continued in many housing markets. However, the one of the latest Demographia Reports (Cox & Pavletich, 2009, p. 1) states that over the past year, house prices have declined in most markets. This

"bursting of the housing bubble" followed an unprecedented increase in housing prices in all markets except some in the United States and Canada. The result is that housing affordability has generally improved, though remains at Median Multiples well above the historic norm in many markets. In the latest report (Cox & Pavletich, 2010), the position reported is somewhat less precarious for overseas markets. For example the commentary states that in the United States and the United Kingdom, the "bubble" markets that had "burst" generally reached a trough and began rising again. In the "boom" markets that did not experience a bubble, house prices generally declined in response to the intense economic disruption that occurred after the Lehman Brother‟s collapse, which signalled the "mortgage meltdown" and the "Great Recession," and the steepest economic decline since the Great Depression.

Earlier reports, e.g. the 2006 Housing Affordability Ratings (Cox & Pavletich, 2006) drew attention to the most pervasive housing affordability crisis is in Australia, with an overall Median Multiple of 6.6. Affordability was stated in that Report to be only marginally better in New Zealand (6.0) Ireland (5.7), and the United Kingdom (5.5). On the other hand, the national Median Multiple in Canada is 3.2, indicating that housing is one-half as expensive relative to incomes as in Australia. This also compares to the national Median Multiple in the United States which is 3.7.

The position now reported indicates Australia remains in the "severely unaffordable markets" which are concentrated in Australia and the United Kingdom. The United States also reported severely unaffordable, with nine of the 11 US severely unaffordable markets in California. Severely unaffordable markets were also reported in New Zealand in Canada. However, it is commented (Cox & Pavletich, 2010, p. 2) that many of these severely unaffordable markets have experienced steep price declines in the last year. It is worth noting that this is contrary to the Australian experience.

The Demographia reports over the last few years have continue to cite the least affordable markets as being generally in California, Hawaii, the US East Coast, Australia, the United Kingdom, New Zealand and Vancouver. Whilst the least affordable market rated is Los Angeles & Orange County, with a Median Multiple of 11.4, which is far above the "severely unaffordable" threshold of 5.1. Brisbane is rated "severely unaffordable" at 6.1 median multiple. Figure 2-1 below provides a graphical comparison:

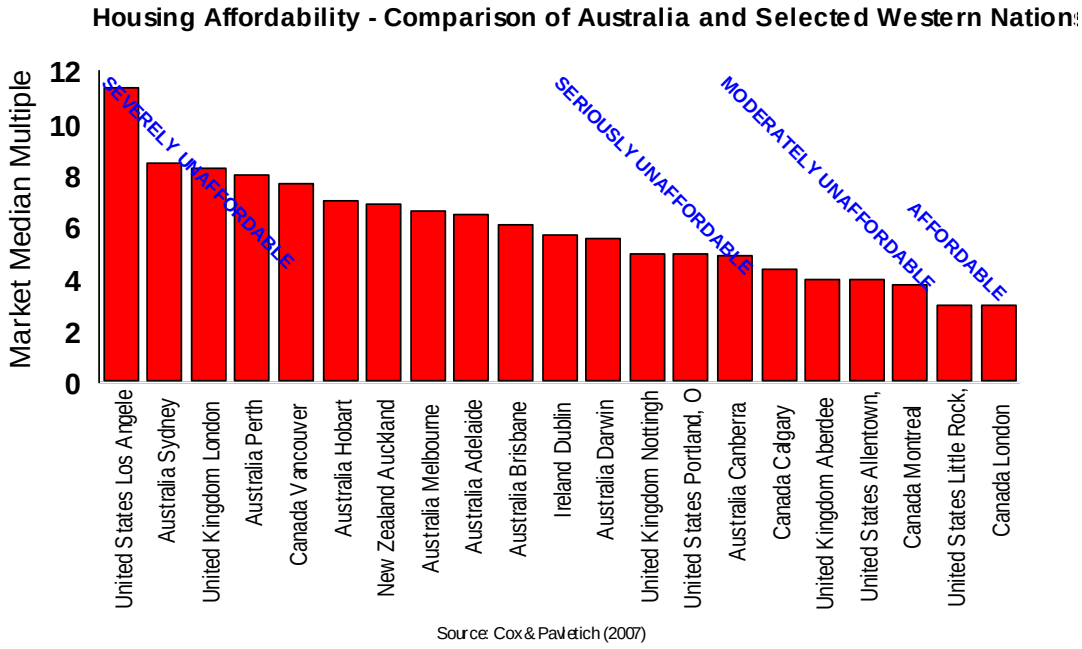


Figure 2-1 Housing Affordability Nation Comparison

Therefore, Brisbane (along with most other Australian capital cities) is categorised as "severely unaffordable":

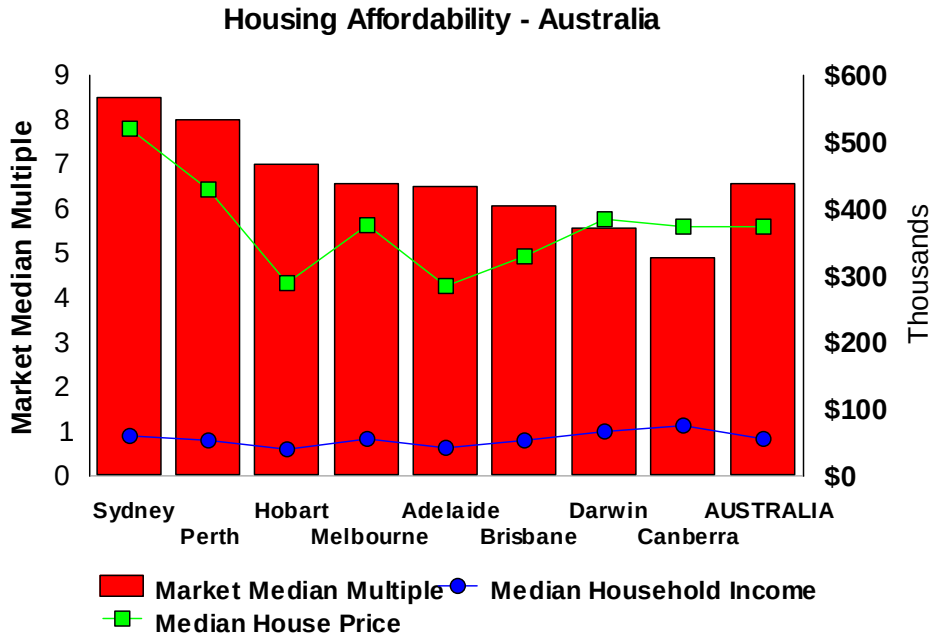


Figure 2-2 Housing Affordability - Australia. Extracted from Cox & Pavletich (2007)

The detail of this is shown in Table 2-1 below:

Table 2-1 Housing Affordability - Comparison of Australian Capital Cities against others.

AUSTRALIA Domicile	**Nation Market Median Multiple**	**Median House Price**	**Median Household Income**
Adelaide	6.5	$285,000	$43,900
Brisbane	**6.1**	**$330,000**	**$54,000**
Canberra	4.9	$375,000	$76,000
Darwin	5.6	$385,000	$68,200
Hobart	7.0	$290,000	$41,500
Melbourne	6.6	$377,000	$57,100
Perth	8.0	$430,000	$53,900
Sydney	8.5	$520,300	$61,200
AUSTRALIA Median	**6.6**	**Av. $374,037**	**Av. $56,975**
CANADA			
Canada Calgary	4.4	$319,000	$73,300
Median	3.2		
IRELAND			
Ireland Dublin	5.7	€354,000	€61,900
NEW ZEALAND			
New Zealand Auckland	6.9	$395,000	$57,500
Median	6.0		
UNITED KINGDOM			
United Kingdom Aberdeen	4.0	£105,874	£26,454
Median	5.5		
UNITED STATES			
United States Akron, OH	2.4	$118,200	$50,000
Median	3.7		

Source: extracted from 3rd Annual Demographia International Housing Affordability Survey (Cox & Pavletich, 2006)

Whilst the Demographia report examines a number of possibilities as to why affordability is problematic, it does correlate a strong relationship between the quantum of regulation, and affordability. A number of commentators suggest that the more highly regulated markets overwhelmingly exhibit inflated housing prices, while more liberally regulated markets tend to remain more affordable (Cox & Pavletich, 2006).

However, the *quantum* of regulation may not necessarily equate to the *strength* of regulation. For example, it has been demonstrated that a strong government role in urban policy and land regulation explains the higher levels of affordable housing

achieved through the planning process in the United Kingdom and the Netherlands, in comparison to Australia and North America (Gurran et al., 2007)[3].

One logical explanation as to why land supply restrictions correlate strongly with affordability is the imputation of holding costs that inevitably reside alongside increased time taken for regulators to process development applications.

Demographia, in their latest survey (Cox & Pavletich, 2010) indicate that the least affordable markets (denoted "Severely Unaffordable") remain generally in Australia, Canada's province of British Columbia, New Zealand, the United Kingdom and California. Interestingly, the previous Report acknowledges "considerable intellectual progress" having been made Australia and selective locations elsewhere (Cox & Pavletich, 2009, p. 3), as an increasing number of analysts and public officials have recognized the nexus between prescriptive planning and higher house prices. Furthermore, whilst 2008 saw the 5 least affordable markets in the United States, this year, 3 of the least affordable markets are in Australia and only one in the United States. The reason for this change is explained as being the result of the steep housing price declines that have been experienced in some markets in the United States, especially California.

The 30/40 Affordability Rule

A more traditional and perhaps simplified approach towards housing affordability is a measurement based on mortgage or rental payments. It is based on a "rule of thumb" being that housing costs on mortgage or rental payments should not exceed 30% of household income - in the case of the lowest 40% of household income distribution. This is known as the "30/40 affordability rule" and is regarded by many commentators as relatively sound measure, but perhaps more widely as a convenient measure since *"it provides continuity with traditionally used measures and because it is simple to apply and easy to understand"* (Gabriel et al., 2005).

[3] In Australia, the lack of direct Commonwealth Government responsibility for urban policy and planning is not necessarily a barrier to achieving a broader mandate for promoting affordable housing through the planning system, although it does help explain why this has not been achieved to date (Gurran et al., 2007).

Such low income households are considered to place themselves in a position of "housing stress".

Yates calculates that in Australia in 2001, some 836,000 households or just over 13 per cent of all households were in housing stress with housing cost ratios of 30 per cent of more of their gross household income (Yates et al., 2006a). Berry comments that there is a growing pool of households experiencing housing-related hardship or 'housing stress' which is in fact *created* by the pattern of government intervention occurring at a time of increasing economic inequality and insecurity, on the one hand, and high house price inflation (especially in the large cities), on the other (Berry, Mike, 2002b). Conversely, the incidence of housing stress may only represent a short term phenomenon for some. Colloquially put, the cliché of a short term pain for a long term gain (Karantonis, 2009) has been described where the pain of affordability stress ultimately becomes a gain due to an increase in wealth especially as household incomes eventually rise over time. Regardless, it has been suggested that the key policy challenge raised here is to explore ways of more effectively attracting significant volumes of private investment into the provision of affordable housing, to complement existing government programs in the area.

Other Measures of Affordability

Whilst the "30/40 affordability rule" definition is certainly a convenient guideline as alluded to previously, it may be overly simplistic. It has been recognised by some researchers that in fact commonly held measures may disguise the true extent of housing stress in Australia (Burke, 2004). Gabriel (Gabriel et al., 2005) suggests that a case can be made for providing additional complementary indicators that are more responsive to household needs and capacity to pay. For example, different household types and different income groups have very different capacities to pay for their housing and that the measured outcomes will differ according to the way in which key variables are defined. The NSW Centre for Affordable Housing also caution against using such formulas that are sometimes used to describe housing affordability. They suggest that while this can provide a useful benchmark of housing stress, the reality is that the definition of affordability varies according to a household's individual circumstances. Accordingly, their efforts in developing affordable housing have mainly targeted low-moderate income households that are

earning less than the median income for the area where they live and are paying a significant proportion of their income toward housing costs ("About Affordable Housing," 2007). There are in fact various sets of measures related to households' ability to access affordable housing, whether ownership or rental. Attributes of major affordability measures used in Australia each have their own characteristics and problems in terms of methodology, which are broadly based on imputed affordability using a variety of data sources. Each of these measures have a different way of capturing the changing ability of households to afford home purchase or access rental. None is necessarily better than the others. They all have different strengths and weaknesses, including overcoming the challenges of data limitations and methodology (Gabriel et al., 2005).

Other problems with using the 25 and 30 per cent benchmark measures to examine housing affordability have also been established. Research conducted several years ago in Australia (Burke, 2004) found that additional costs and lower income measures push many over the 25 per cent benchmark, helping to explain anomalies amongst public renters. The nature of this related to data: (i) being based on disposable (after tax) incomes, and public housing rent rebates being based on pre-tax income and, (ii) including service charges, house or contents insurance, and any expenses designated by the respondent such as self-maintenance.

There are also other difficulties associated with the assessment of affordability that relies upon broadly based indicators. For example, it is difficult to examine market trends as a whole since, as has been observed (Burke et al., 2007), the housing market is incredibly varied in composition and performance. It is not a single market, and trend averages can therefore be misleading.

2.2.5 THE CORRELATION OF HOUSING AFFORDABILITY & HOUSING COSTS

Regardless of methodology, it has been well established that that housing affordability problems are highly correlated with high housing costs (Yates et al., 2006a). This highlights the fact that high housing costs as well as low incomes are the major contributor to housing affordability problems for working households. Research continues to demonstrate that in addition to Sydney, priority regions with a

high incidence of stress include south-east Queensland and in the inner regions of Melbourne (in that order).

It is apparent that the consequences and physical manifestation of housing stress can be dire. This has been described as over-crowding and under occupancy, homelessness, spatial segregation differentiated by socio-economic status and physical dilapidation, resulting in higher incidences of crime, lowered employment prospects, and adverse family and community relationships (Cox & Pavletich, 2007).

In Queensland, government initiatives in the development of affordable housing is summarised in the QHAS (*Queensland Housing Affordability Strategy*, 2007), however the chief tenants of this policy are expanded by the Department of Housing whom have developed a definition of affordable housing to assist stakeholders in the broader housing system to identify ways they can contribute to the provision of affordable housing. This definition suggests that a number of factors should be considered ("What is 'affordable housing'?," 2007) including the appropriateness of the dwelling, housing and social mix, tenure choice, location of housing, quality of environmental planning and design, and cost.

The above definition builds upon that quoted from an earlier 2005 departmental document., and may be an attempt to take into account important emerging trends that place even greater emphasis on the nature and importance of affordability and choice. For example, families consisting of a couple with children - typically cited as the most dominant group comprising the majority of households are now being overtaken in a proportionate sense by “smaller households” (lone persons and childless couples). Recognition needs to be given to the increasing propensity of this group which for the first time in will actually overtake as the dominant form of household across most areas of Australia within the next few years. Certainly, this group as a whole do prefer access to entertainment facilities such as cafes and restaurants, however there is no evidence to support they prefer smaller dwellings than families with children – in fact the evidence points towards the opposite. Indeed, the Housing Affordability debate has to some extent ignored the fact that house sizes in Australia generally are increasing in size despite changing demographics, and in many instances this phenomenon is more apparent in this country compared to many others. This obviously not only has important implications for planners, but also

highlights the need for a more balanced understanding of the key drivers behind affordability.

The QHAS requires improving factors that enable the market to respond more effectively to provide housing - especially affordable housing. Given the scenario that exists as described above, this is obviously a key challenge for the region.

2.3 HOLDING & OPPORTUNITY COST THEORY IN A PROPERTY DEVELOPMENT CONTEXT

2.3.1 HOLDING COST COMPONENTS

Understanding the nature and composition of holding costs applying in residential property markets (particularly greenfield development) provides a basis for appreciating some of the significant drivers behind property prices. It also provides the means to investigate the impact of less visible costs, such as indirect regulatory costs - especially important in the context of housing affordability. Holding cost fundamentals involve understanding the nature of opportunity costs, which include (Eccles et al., 1999) the prevailing level of interest rates; the length of time that the development takes to complete; and the length of time that the development takes to produce income or sell. These factors make holding cost calculations somewhat complex.

The computation and methodology behind the calculation of holding costs varies widely. In fact, it is not only variable, but in some instances completely ignored. Ambiguity exists in terms of the inclusion of various elements of holding costs and assessment of their relative contribution. Perhaps this may in part be explained by their nature: such costs are not always immediately apparent. They are not as visible as more tangible cost items associated with greenfield development such as regulatory fees, government taxes, acquisition costs, selling fees, commissions and others. Holding costs are also more difficult to evaluate since for the most part they must be ultimately assessed over time in an ever-changing environment based on their strong relationship with opportunity cost which is in turn dependant, inter alia, upon prevailing inflation and / or interest rates

In relation to the time component, it is logical, though not apparent in every case, that larger, more complex property developments involve larger amounts of

capital investment over commensurately longer timeframes. This implies higher levels of holding costs, which are incurred primarily, but not solely, by property developers. Property development applications (DA's) for more complex property developments also typically take a longer period of time for regulatory authorities to assess how or if statutory guidelines are met. It is time during which a developer must "carry" any costs outlaid on a project. In the case of large residential estate developments, it is more likely to be lengthy than not. This period can therefore represent a significant component, but not the only component, of holding costs. However, whilst a link exists between the delays experienced in obtaining planning approvals, and housing affordability, that link – although likely - does not necessarily establish itself as a holding cost.

Additional examples of holding costs in property development include:

- Opportunity costs calculated over the time a developer must "carry" any costs outlaid on a particular project / loss of acquisition costs: e.g. undeveloped land cost or financial commitment to site acquisition
- costs of meeting planning regulations
- costs associated with the statutory approval process
- development application or administration fees
- rates, special council charges and land tax (paid during acquisition, development and construction)
- any contributions made for physical and social infrastructure
- expenses in participating in the planning process, through staff time and site holding costs while approval is sought
- delays in the production process leading to reduced or cancelled financial returns
- interest over a development period; interest paid (or interest lost) on any of the above expenses until recoupment through selling final product

2.3.2 STATUTORY INTERPRETATION OF HOLDING COSTS

The assent of recent legislation in Queensland ("Valuation of Land and Other Legislation Amendment Act (Qld)," 2010) has amended the Land Act ("Valuation of Land Act (Qld) 1944,") to incorporate a definition of holding costs as follows [S5(4)]:

> ***holding costs*** means rates, land tax and the interest cost at the bond rate of applying funds for the construction of physical improvements and holding the land during the construction period for the improvements.

The above definition is in the context of an explanation of the meaning of improvements as determined under the Act. In this instance, the value of improvements (determined under the Act which is primarily designed for use in rating and taxing purposes) cannot be more than the total of the depreciated construction price of the physical improvements, and an allowance for *"holding costs over the time it would take to have had constructed improvements of a nature and efficiency equivalent to the existing improvements"*.

This statutory interpretation of holding costs is a narrow definition which is confined for use in legislative documents. It does not purport to have widespread application. In particular, in calculating holding costs, it prescribes adoption of the "bond rate". In so doing, it is overly prescriptive and for reasons discussed herein, represents an oversimplification of a more complex theoretical concept. It also does not take into account a raft of holding cost components outside of rates, land tax, and interest costs.

2.3.3 HOLDING PERIOD / HOLDING PERIOD RETURN

A derivation of the holding cost concept is the "holding period". The "holding period", although related, is not equivalent to holding cost terminology. It is regularly adopted as a more generalised investment term, and is often used in association with discounting calculations in DCF analyses and similar studies. It refers to the period in which an investment is intended to be held based on investor requirements or expectations, taking into account factors such as anticipated market growth and inflation. It's length can usually be determined (Reed, 2007) by

reviewing a property's lease expiration dates, with the length of the holding period and the discount rate being interactive. That is, the longer the holding period, the greater the risk and as a consequence, the higher the discount rate. The holding period is alternately known as the "investment period" (Brailsford et al., 2004, p. 5; Parrino & Kidwell, 2009, p. 211) - typically used in measuring returns, i.e. *"change in value arising from an investment over the period of investment"*. Brailsford (2004) also equates the holding period return as the "yield" in the context of valuation of securities, or alternatively the "ex post" actual return eventuating representing a gain or loss encountered by the owner of an asset over a given period (Hovey, 2005, p. 116). This is consistent with "holding period return" being used to describe the return that is received if a security is held for a specific period of time (Peacock et al., 2003, p. 242; Petty et al., 2006, pp. 251, 611) which may be calculated as:

Equation 2-1

$$R_t = \frac{P_t}{P_{t-1}} - 1$$

Where R_t = the holding period return in month $_t$ for the shares (or the market index)

P_t = the price of a firm's shares (or the Market Index value) at the end of month $_t$

P_{t-1} = price or Index value at the end of the month prior to month $_t$

Commercial real estate tends to have a much longer holding period than equities, due in part to the relatively high transaction costs and illiquidity issues (Sayce et al., 2006). Research has shown that a median holding period for commercial property is between 8 and 12 years (Collett et al., 2003). The age of property and return are key factors influencing the holding period , reducing in properties acquired during a recession. In the UK an analysis period of 5 years is commonly used, 10 years is more common in the US, and 20 years in the Netherlands in not uncommon. Property traders may use shorter analysis periods and those using long term finance may use a longer analysis in line with the debt repayment period. As a rule of thumb the shorter the analysis period, the more sensitive the IRR and NPV will be to the exit valuation.

A stark example of the impact of "holding on" – the extent to which holding costs can promote action, and sometimes extreme action by land owners - can be seen in the propensity of banks unloading repossessed property in order to avoid future losses. Deemed "the cost of holding on", a United States commentator (Suskind, 1991) observed that during a period of real-estate glut, banks' future losses from unloading repossessed property can run to billions of dollars given that sales generally fetch only 50% to 60% of the loan value. The dilemma faced in this situation is paradoxical: should banks sell property at "knockdown prices" and take another heavy charge against earnings? Or should they hold it - hoping for a higher price if the market recovers - and incur continuing costs of managing and maintaining the property?

Holding on may also have relevance in the context of property vacancy. It has been suggested that it is not fully known how the natural vacancy rate responds to improved affordability (Allmendinger et al., 2005). It is possible that a higher vacancy rate would be the norm in a less constrained market. For example, the Policy Exchange Research Institute in the United Kingdom (Evans & Hartwich, 2005) comment that a 3.4%, vacancy rates in Britain are low by international standards; however this is to be expected, because at high property prices, the opportunity cost of leaving dwellings vacant is also high.

By contrast, this research focuses on a greenfield development context, where the holding period generally refers to the time during which an investment (typically made by a developer) is first committed, until the time of eventual recoupment upon sale.

2.3.4 THE TREATMENT OF HOLDING COSTS BY COMMERCIALLY AVAILABLE SOFTWARE MODELS

Holding cost computations by commercial available software are typically provided in two ways. Using Estate Master as an example (*Development Feasibility*, and *Development Management* modules) the following may be observed:

Firstly, the "holding period" is obviated by assumptions contained within discounting calculations in the DCF analyses / feasibility. This is the period in which an investment is intended to be held based on investor expectations - from the point of initial financial commitment (acquisition), to the sales revenue period. By default,

it takes into account factors such as anticipated market growth and revenue span. Interest on borrowings (and interest received on re-investment of surplus funds) is incorporated in the discount rate. Financing charges including interest on outlays is included by default and represent part of the total development cost. Interest earned on deposit in a trust account (often utilised in an acquisition transaction) is computed over the time that deposit sits in the trust account – however the interest is divided evenly between the seller (Land Owner) and the buyer (Developer)[4]: in some circumstances this may prove too prescriptive. Furthermore, these holding costs, although computed, are not separately identifiable in the project summaries. There may also be an argument that rare hyperinflationary conditions cannot be taken into account, at least from a holding cost point of view, i.e. where inflation exceeds the interest rate. The problem compounds where such conditions are not reflected in revenues received from property.

Secondly, there is a separate, readily identifiable input category denoted "Land Holding Costs" which is in fact a repository for capital expenditure line item or items representing financial commitments during construction. Whilst these items can be escalated (or left as a fixed cost), this component is provided for the inclusion of items such as insurance, council rates and land taxes and the like, incurred during the time of property development – and entered as whole dollar amount. These are not operational costs, but "once-off" or relatively infrequent capital items incurred by a developer during the development phase – so they do represent bona fide holding costs. In theory, land acquisition cost could also be included here; however this is more appropriately sited under its own section where the payment regimes and settlement details can be detailed, along with other acquisition cost items such as valuation charges and legal expenses. The opportunity cost of these items, i.e. interest equivalent incurred over time based on their capital outlay, is picked up - but imputed into the cash flow itself and not separated out for later identification.

It may be concluded that the recognition of holding costs, although generally incorporated in commercially available development models, are not expressly

[4] Both the deposit percentage and interest on deposit are optional inputs

identifiable. This is despite the separation of identifiable "land holding cost" capital line items.

2.3.5 THE COMPLEXITY OF THE HOLDING COST CALCULATION

Quantifying holding costs can be complex depending on the Project and the variables applying in particular circumstances. Added complexity arises since holding costs can occur over any or even all stages involved in a property development pipeline (i.e. those stages over which a property is developed – from initial strategic identification of a site, until construction completion and beyond[5]). The development pipeline incorporates "Development Costs" which encompass all the costs associated with transforming the land from an englobo parcel to an urban lot ready for construction of the dwelling (Bryant, 2010, p. 10). This includes holding costs, along with an array of others such as acquisition costs, council charges for infrastructure provision, civil works, marketing, and professional fees.

The Queensland Government's recent 'Affordable Housing Strategy' (QHAS) acknowledges holding costs due to costs associated with delays in obtaining assessment and approvals can add up to $20,000 per unit to the end price (*Queensland Housing Affordability Strategy*, 2007). These are denoted as being "development holding costs during the assessment period" This cost – "*adding between $15,000 - $20,000 per dwelling"* is stated to be passed on to the end purchaser. Even though the QHAS does not elucidate their computation methodology, some commentators believe this to be a conservative figure, and highlight the extent to which these costs can escalate. As an example, an RDC Media Release (Elliott, 2007) calculated that in a recent Queensland development project the tax and regulatory charges accounted for 26% of the purchase price of $579,000. It is pointed out that excessive delays and massive court costs (on appeals) all result in excessive holding costs. In the aforementioned example, involving a 112 apartment project in Brisbane's West End, a total tax bill of $150,000 per unit was

[5] Holding costs continue to be incurred by a developer until completion and settlement of sales of all allotments on a development.

revealed. Elliot calculates GST on the sale ($57,000) state stamp duty on sale ($21,522) GST on construction ($32,044) then the Brisbane Council infrastructure charges ($22,857) plus the state land tax ($2,779) and council rates ($2,161) along with state registration fees for titles ($141). He believes the situation is similar elsewhere, but is worst of all in Sydney.

In the aforementioned example, the interest bill on the holding cost associated with delays in council assessment was calculated to be $8,928. However, the analyst provides limited information as to either how this cost was derived, or any detail on the methodology used. It also ignores other holding costs associated over the total development timeframe; for example, opportunity costs commencing with commitment upon land acquisition, re-financing requirement (if any), and financial commitments during construction.

Since holding costs are incurred over the total period of financial commitment by stakeholders, they are impacted by various responses to market conditions existing and changing over that time. In the case of a greenfield development, this includes not only prevailing interest rates / investment alternatives that underpin the opportunity cost, but also the period of investment commencing with property acquisition right through to time taken for sales to be effected upon dwelling completion.

2.3.6 HOLDING COSTS EVOLUTION FROM INVENTORY MANAGEMENT EOQ MODELS.

EOQ (Economic order Quantity) models, and other similar ones such as Just-In-Time Purchasing Models, are used in the management of inventories. Their aim is to establish the level of inventory that provides an optimum balance between minimising the impact of stock-outs, and the cost of investment required to hold inventory. Investment in inventory avoids the cost of being out of stock and the resultant potential loss in sales or production.

The basic EOQ (Economic Order Quantity) model identifies the penalty associated with ordering either too much or too little. Holding costs are in reality simply a derivation of the EOQ model, where the shape of the “holding cost curve” demonstrates the sensitivity of the basic EOQ model to lot-size errors when holding costs are assumed to be a strictly increasing (though not necessarily linear) function

of average inventory (Brown et al., 1986). The premise is that the penalty associated with ordering either too much or too little is a function not only of the size of the error but of the shape of the holding-cost curve as well.

Derivations of the EOQ model may be found in a variety of applications. For example, most models of inventory control utilise modified versions of the EOQ formula, with the capital cost of holding inventory able to be calculated by adding a fixed interest rate, r, times the purchase price, C, to the out-of pocket holding cost However, this assumes the per unit purchase price is constant, therefore where the purchase price *t* varies over time, methods for computing an adjusted interest rate, *r*, are suggested along with modifications of well-known heuristics and formulas for lot-sizing, with *r* being estimated as the sum of the unadjusted interest rate and the average expected purchase price decrease, measured over a period between 1/3 and 2/3 of the length of the order cycle (Berling, 2007). Other variations of the economic order quantity (EOQ) model such as Ferguson's enable its use in the case of perishable goods, such as milk, and produce (Ferguson et al., 2007). This is achieved by considering cumulative holding cost as a nonlinear function of time. In this instance the holding cost curve parameters can be estimated via a regression approach from the product's usual holding cost (storage plus capital costs), lifetime, and markdown policy. Thus, a significant improvement in cost vis-à-vis the classic EOQ model is provided.

Some commentators determine that holding cost rate represent outcomes of a net present value approach, and an average cost approach, which are approximately equivalent. This has been the approach undertaken for more complex inventory holding cost measurement. An example of this may be seen in the measurement of inventory in a two-product system involving joint manufacturing and remanufacturing (Çorbacıoğlua & van der Laan, 2007) whom conclude that the correct holding cost rates deviate from traditional valuation methodology, with impact on operational performance demonstrable.

Nonetheless, it is the EOQ model that forms the basis for examining the cost of holding money. In the context of hyperinflationary conditions, research undertaken in the UK (Higson et al., 2007) has enabled methodology for estimation of loss in purchasing power from holding monetary items able to be tested via a 'two point' estimation formulae. This appears to be effective in scenarios where only sparse

information sets are available – albeit certain assumptions being made about the way monetary holdings respond to variations in the purchasing power of the currency.

At least five costs can be identified associated with holding and carrying inventory (Bishop et al., 2004, p. 538):

1. The purchase cost of the inventory
2. Costs associated with placing an order
3. Storage costs
4. The opportunity cost of funds invested in inventory
5. Losses attributable to deterioration and obsolescence

In a similar way, there are broadly equivalent costs involved in establishing a greenfield residential property development, where there are costs involving investment in land acquisition holding, and associated carrying costs. They can be compared to the general EOQ model for inventory holding and carrying costs as follows:

EOQ inventory Model costs	Equivalent Greenfield Housing Property Development Project Holding Costs
Purchase cost of the inventory	Purchase price of the acquisition (typically, vacant land)
Costs associated with placing an order	Costs associated with legal's and settlement
Storage costs	Rates and Land Taxes
The opportunity cost of funds invested in inventory	The opportunity cost of funds invested in the acquisition
Losses attributable to deterioration and obsolescence	Property maintenance costs (e.g. weed control, drainage, boundary fencing, etc.)

Other holding costs that are immediately apparent in a greenfield housing property development project might also include:

- Other acquisition costs
- Insurances

- Provision of services
- Escalations over time

Holding costs therefore represent "opportunity lost", or in broad terms, "opportunity cost". Opportunity costs cash flows have been described (Petty et al., 2006, p. 334) as a reflection of cash flows that would have been received if the project under consideration had been rejected. This a convenient description of the kinds of costs noted in the above table that are outlaid at the commencement, and during the course of development, of a greenfield housing development site.

2.3.7 OPPORTUNITY AND SUNK COSTS DEFINED

Opportunity costs refer to cash flows that are lost because a given project consumes scarce resources that would have produced cash flows if that project had been rejected (Petty et al., 2006, p. 334). They represent cash flows that could be realised from the best alternative use of an owned assert (Gitman et al., 2005, p. 324). Even retained earnings in a firm have an associated opportunity cost by which the return from some project replaces another source of return from securities that have a similar degree of risk (Guthrie & Lemon, 2004, pp. 235, 337). It follows that opportunity cost of funds can be described as *"the next best rate of return available to the investor for a given level of risk"* (Petty et al., 2006, p. 612) and similar variations (such as Parrino & Kidwell, 2009, p. 255). From a practical point of view, the ability to measure opportunity costs may be difficult (Bishop et al., 2004, pp. 201-202). This is because of the need to identify net after tax cash flows in equidistant periods (usually years), discounted to their present value at an assumed after-tax rate of return. This might be relatively easy to identify in the case of say, a firm considering expansion of its plant by spending capital on modifying facilities that already exist. If the firm does not use the property for the proposed expansion, it could sell it, and this would be something foregone if the project does not use its property. Bishop (2004) suggests that there is an opportunity cost in using the property for the project, and the project should therefore bear this cost. However such an opportunity cost might also be borne in the case of unused capacity on computer equipment: in this instance the expansion of capacity is brought forward,

therefore changing the timing of cash outflows and their associated present value. In this instance, opportunity costs may prove more difficult to identify.

Opportunity costs do not generally include sunk costs which represent past outlays. Because sunk costs have already been made they have no effect on cash flows relevant to a current investment decision, and, unlike opportunity costs, should not therefore be included in a project's incremental cash flows (Gitman et al., 2005, p. 324). However, by way of contrast, holding costs may include the cost of maintaining past outlays. For example, this could include carrying costs such as interest.

2.3.8 OPPORTUNITY COST AND THE PRESENT VALUE / DISCOUNT FACTOR

The holding cost of an investment is generally regarded as being equivalent to opportunity cost. Opportunity cost has been, in its simplest form, described as a term used by economists to depict when someone forgoes one opportunity to take another (Powell & Stringham, 2004). Another definition (Miles et al., 2004) describes opportunity cost as being interest that could have been earned that is forgone: this forgone interest represents the opportunity cost associated with receiving a dollar in the future rather than today. Consequently, today's value, or the present value, of the dollar to be received in a given time period should be reduced by the cost of the "lost opportunity" over that same time period.

The concept of opportunity cost therefore involves the calculation of a present value, on the basis that we are solving for the difference between the current day value of a compounded future amount. The amount of interest that could have been earned during the term of an investment – the compound interest – represents the difference between the present value and the future value amount, and is known as the discount. Guthrie describes the discount as being the "shrinkage" that occurs when an amount of money is moved back in time at the compound interest rate (Guthrie & Lemon, 2004). This is also more generally known as the opportunity cost, or perhaps more colloquially, opportunity "lost".

The general present value formula is expressed as:

Equation 2-2

$$PV = \frac{FV}{(1+i)^n}$$

Where PV is the Present Value

FV is the Future value

i s the interest rate per period

n s the total interest periods

The transposed formula $PV = FV\ (1+i)^{-n}$ is typically expressed since it is easier that way for the algebraic calculator. The factor $(1+i)^{-n}$ is the *discount factor* (also known as the present worth of 1 factor), that is simply the reciprocal of the *accumulation factor*, i.e. $(1+i)^n$ which is the basic tool for solving accrued compound interest.

Thus, we can determine that the discount factor for an investment that can earn 9.5% per annum over 15 years is $(1+0.095)^{-15}$. Accordingly, an asset worth \$100,000 in 15 years time can be calculated to have a present value of \$25,632. The difference between the asset's future worth of \$100,000 and the present value, i.e. in this case \$74,368, represents the "opportunity cost" of investing \$25,632 over 15 years, or the amount of interest that could have been earned at the relevant compound interest rate, had it been invested. Therefore we have a formula for Opportunity Cost *oC* as:

Equation 2-3

$$oC = FV - \left[FV(1+i)^{-n} \right]$$

It is this imputed value over time that is fundamental to the concept of "holding cost". If an investment is made in a certain asset that requires it to be held during a period in which incurs no growth, then the amount of interest foregone because of the need to "hold" the investment is equivalent to the "opportunity cost" of holding the asset. In other words, one depiction is that it represents the interest foregone due to the expense made on the outlay.

2.3.9 OPPORTUNITY COST: IRREVERSIBILITY AND UNCERTAINTY

The risk adjusted expected rate of return that investors will require if they are to own a project μ may be expressed as (taken from Dixit & Pindyck, 1994, p. 450):

Equation 2-4

$$\mu = r + \varphi \rho xm \sigma$$

Where: $r =$ risk free interest rate

$\varphi =$ market price of risk

$x =$ price of an asset perfectly correlated with V

$V =$ Project value

$\rho =$ discount rate

$m =$ short position in replicating riskless portfolio

$Pxm =$ the correlation of x with the market portfolio ($Pxm = Pvm$)

$\sigma =$ standard deviation - variance parameter in Brownian (continuous time stochastic process) motion

This formula reflects an assets systematic (non-diversifiable) risk, which is in accord with the Capital Asset Pricing Model (CAPM). It is assumed that α (the expected percentage rate of change of V) is less than the risk adjusted return μ (investment would never occur if this were not the case). If δ denotes the difference between μ and α, i.e.

Equation 2-5

$$\delta = \mu - \alpha \qquad \text{(Assumes } \delta > 0\text{)}$$

If μ is the expected rate of return from owning a completed project, then it is the equilibrium rate established by the capital market, and includes an appropriate risk premium. If $\delta > 0$, the expected rate of capital gain on a project is less than μ. **Hence, δ is an opportunity cost of delaying investment, and instead keeping the option to invest alive**. If δ were zero, there would be no opportunity cost in keeping an option alive, and one would never invest, no matter how high the NPV of a project. That is why $\delta > 0$ is assumed.

An increase in δ reduces the critical value V - increasing the incentive to invest rather than wait. The reason for this is that δ is the shortfall in the expected rate of return from holding the option to invest rather than the completed project itself, and hence represents an opportunity cost of waiting, rather than investing now. For any value of σ, V always decreases as δ is increased.

Whilst irreversibility and uncertainty should raise the threshold (e.g. expected rate of return on a project) required for investment to occur, the effects of uncertainty on the long run average rate of investment or average capital cost cannot be ascertained without making restrictive functional or parametric assumptions. This complicates otherwise simple equilibrium relationships between rates of investment and measures of risk. It also explains why it has been argued (e.g. Dixit & Pindyck, 1994, p. 26) that in establishing the decision to invest, the standard NPV approach requires modification due to the irreversibility of an investment expenditure.

2.3.10 THE DISCOUNT RATE AS THE OPPORTUNITY COST OF CAPITAL

Rate of return is often referred to as the discount rate or opportunity cost of capital (Bishop et al., 2004, p. 10). It can be described as the return foregone by investing in a security rather than the next best alternative with equivalent characteristics. The cost of capital is quite significant in capital budgeting (Guthrie & Lemon, 2004, p. 235). The *discount rate* is commonly used in capital budgeting, and represents a specified rate used in discounting cash flows. Other rates, such as required rate, hurdle rate, opportunity cost or cost of capital, are all used one way or another, in establishing the minimum return that must be earned on a project to leave a firm's market value unchanged (Gitman et al., 2005, p. 362). Capital budgeting techniques such as net present value (NPV) are typically used to ascertain whether or not to accept or reject project proposals. NPV is found by subtracting a project's initial investment from the present value of its net cash inflows, discounted at a rate equal to the firm's cost of capital. Subsequently, if the NPV is greater than zero, it is estimated that the project will exceed the firm's opportunity cost of capital, and therefore likely to be accepted. Other capital budgeting techniques, such as the more widely used internal rate of return (IRR), use similar approaches for evaluating investment alternatives. It also provides the means to establish accept or reject decisions based on whether the rate (in this case IRR) is less than, or greater than the

cost of capital (a project being accepted in the latter case). The equations may be depicted as (Gitman et al., 2005, pp. 362, 364):

Equation 2-6

Net Present Value ***Internal rate of Return***

$$NPV = \sum_{t=1}^{n} (CF_t \times PVIF_{kt}) - \mathrm{CF_0} \qquad \mathrm{CF_0} = \sum_{t=1}^{n} \left(\frac{CF_t}{1 + IRR^{t}} \right)$$

where: $CF_t =$ risk free interest rate

$k =$ firm's cost of capital

$\mathrm{CF_0} =$ Project's initial investment

In effect, mathematically the IRR is found by solving the NPV equation for the value of k that causes NPV to equal zero. The IRR is discount rate that equates the present value of a project's expected cash inflows to the present value of the projects outflows where (Parrino & Kidwell, 2009, p. 331):

Equation 2-7

$$PV\ (Project's\ future\ cash\ flows) = PV\ (Cost\ of\ the\ Project)$$

In other words, IRR is the discount rate that causes the NPV to equal zero. Nonetheless, as pointed out by Gitman et al (2005), conflicts in outcomes between these two methodologies are not unusual; a matter agreed with by numerous commentators (Bishop et al., 2004, p. 205; Gitman et al., 2005, p. 369; Parrino & Kidwell, 2009, p. 332; Peacock et al., 2003, p. 298; Petty et al., 2006, p. 398) whom establish that in many instances, the IRR and NPV methods do not give the same answer. This is because of the mathematical properties of the equations, including differences in the magnitude and timing of cash flows (Gitman et al., 2005, p. 369). Nonetheless, whilst there is no guarantee that NPV and IRR will rank projects in the same order, both methods should reach the same conclusion about the acceptability or non-acceptability of projects.

Selection of Interest Rate Applicable for the Calculation of Opportunity Cost

Obviously, the longer the time taken, the greater the cost of holding the asset. However, what is often the greatest difficulty to determine is the selection of the interest rate. As pointed out (Darnell & Evans, 1988), the rate of interest provides the correct measure only if the relevant alternative to holding cash balances is holding interest bearing assets. That suggests that the opportunity cost measurement should reflect the utility that is anticipated to having to forgo as a result of making the choice to hold money. The definition given for "Opportunity cost" therefore relies upon a comparison between holding non-interest bearing money, and the best alternative providing the greatest financial yield.

The Inclusion of Inflation

In the context of investment, the treatment of inflation is a matter for considerable discussion amongst academics. There is a variance of opinion as to whether it should be included in investment cash flow projections. Regardless, there is a strong argument in favour of consistency, with regards the relationship between cash flows and the discount rate, i.e. if cash flows are inclusive of inflation, then so should the discount rate; and if cash flows exclude inflation predictions, the discount rate should also exclude inflation. It may be concluded (Petty et al., 2006, p. 335) that *"if future cash flows are adjusted to include the effects of expected inflation, then the discount rate should also include the effects of expected inflation"*.

The usual approach to measuring the cost of holding money is to note that by holding cash balances an individual foregoes income that could be earned on an interest-bearing asset (Darnell & Evans, 1988). From this, Darnell states, it is usually inferred that the 'opportunity cost' of holding cash is determined by the rate of interest. Further, any debate has been over the selection of a data proxy for the rate of interest (e.g. should it be a short/long rate? the dividend price ratio? the whole structure of interest rates? etc.). The value v of holding non-interest bearing money is zero, since the future value of \$1 remains \$1, no matter the passage of time: the face value remains the same. In that instance, $v_1 = 1$. In the case of holding interest bearing money the formula is equivalent to the impact of *r* the nominal interest rate is $v_2 = (1 + r)$. However, as Darnell argues, the value of holding a physical good is

equivalent to a change in value due to η inflation, expressed as $v_3 = (1+\eta)$. Thus, the results for each possibility can be expressed in the following table:

Table 2-2 Derivation of financial gains foregone (the "best alternatives" for holding cash)

Action	Relevant alternative action	Percentage gain foregone
Holding non-interest bearing money	Holding interest bearing money	$(v_2 - v_1)/v_1 = r$
Holding non-interest bearing money	Holding a physical good	$(v_3 - v_1)/v_1 = \eta$

Adapted from The Holding Cost of Money (Darnell & Evans, 1988)

This argues that in determining the cost of holding these money balances is the greater of the nominal interest rate, and the inflation rate. This is because whilst the monetary gain foregone in the case of purchase of an interest bearing asset is the nominal interest rate, the monetary gain foregone in the case of a good is the rate of inflation. This identifies the potential gain foregone willingly, in order to enjoy the benefits of holding the asset.

Accordingly, the general formula for the expected cost of holding money may be expressed as[6]:

Equation 2-8

$$oC = \max(r, \eta)$$

[6] A number of interesting points are noted (Darnell & Evans, 1988) whom state that (1) the real rate of interest is never the holding cost of non-interest-bearing money. The real rate of interest may be seen as the opportunity cost of buying a good when holding an interest bearing asset is perceived as the best alternative. (2) In studies of hyperinflation, the opportunity cost off holding real balances has been identified as the expected rate of inflation. Since in such episodes the inflation rate persistently exceeds the nominal rate of interest, the analysis presented provides the explicit theoretical justification for this practice.

Utilisation of Weighted Average Cost of Capital (WACC).

Utilisation of the Weighted Average Cost of Capital (WACC) concept can be useful where project financing is contemplated. It has been demonstrated that using only the 'explicit' cost of financing in project evaluation (i.e. the directly observable cost, e.g. interest rate for debt) understates the 'true' cost (Bishop et al., 2004, p. 450). This is because the implicit cost (the effect of that return on returns required by other investors in a firm) is ignored. Implicit costs represent the increased rate of return required by equity holders to compensate them for increased risk, such as financial risks incurred when raising equity (e.g. lumpiness caused by strategies adopted in raising funds, such as economies of scale obviated by conducting either one or two large raisings as compared to numerous small raisings).

Both the implicit and explicit costs of financing are taken into account when estimating WACC, which seeks to apportion costs according to source or component, over time. The weighted cost of capital approach decisions based on the actual cost of debt, even where less expensive financing instruments are utilised for the entire amount required to fund an investment. This is because if investment decisions were made on that basis, it implicitly uses some of its debt capacity for future investments. s, the cost of a single source of finance should not be used as the hurdle or discount rate for capital-budgeting decisions. This supports the notion (Petty et al., 2006, p. 400) that irrespective of the source of capital that may actually be used to provide finance for a project, a company should always use the WACC as the discount rate to evaluate a project and not the cost of an individual source of capital.

However, WACC may not always represent the rate that is appropriate for calculation of holding costs. This is because of the failure of WACC to embrace hyperinflationary periods, where the inflation rate exceeds the nominal rate of interest. In this uncommon instance, as per the model identified in Table 2-2 (Darnell & Evans, 1988) previously, it can be argued that the cost of holding money balances is the greater of the applicable interest rate (including any WACC calculation), and the inflation rate, i.e. in hyperinflationary conditions the opportunity cost of holding is best represented by the expected rate of inflation.

Variability Caused by Period of Holding & Other Timing Factors

Reed suggests that, in relation to a property asset, the calculation for measuring the cost of the holding period (or property "reversion") is either the application of capitalisation rate to an income stream (if the property is income producing), or conducting a discounted cash flow analysis (DCF) if there is an irregular steam of inflow and / or outflow payments (Reed, 2007). The latter computes the present value of an expected reversion, and in the case of a property model the income stream and reversion are valued in one operation.

Regardless, the longer the holding period, the greater the risk, and therefore the greater the discount rate used in such analysis. Reed states that this applies equally for leveraged or non-leveraged investments since there is an amortised cost in the former, or otherwise an opportunity cost acquired in the latter case. This is in general agreement with the Adams explanation of present value and time (Adams et al., 1968) whom states that in an effective market, the price of land will reflect capitalisation of the anticipated future flow of net rent. Until the time of development, the capitalisation process suggests a time path for land prices. A distinguishing feature of vacant land, however, is that up to the time it is developed the return to the owner is zero, or if we consider taxes and related expenses, negative.

Theoretically, then, if the development of the land has been anticipated, the price of vacant land should tend to follow a time path determined by the discounting of its value at development at the prevailing interest rate. Changes in expectations, interest rates and holding costs, market imperfections, and short term construction requirements will lead to divergence of prices from the path. Relationships between land prices and relevant variables from the economy are to be anticipated. If we assume V at the time of development t, V is itself the present value of an expected series of net returns, and an appropriate rate of discount, i, the present value P, assuming continuous discounting, is as follows (Adams et al., 1968):

Equation 2-9

$$P = V / e^{it}$$

Thus the relative rate of change of the present value, with respect to t is as follows:

Equation 2-10

$$\frac{dP/dt}{P} = -i \quad or -(i+r)$$

Where r is the rate of real estate taxation

V is the value (at the time of development)

t is the time of development

P is the present value

i is the appropriate rate of discount

In other words, the price of an undeveloped piece of land can be expected to grow at the rate $(i+r)$ where i corresponds to the net rate of return which can be earned on other comparable investments. Adams points out that in a perfectly operating market, the present values of properties will be aligned to their anticipated values to the expected dates at which the properties will be developed. If the factors which determine development value and date of development are taken into account, undeveloped land prices may be expected to increase over time at the rate *(i + r).* This is entirely the result of capitalisation and discounting.

The costs of housing may relate to construction costs, land costs, costs of land purchase and eventual sale (i.e. taxation and professional fees), developers profit for risk-taking, and also financial costs including interest costs and opportunity costs. However, it is the latter that is considered here. This includes (Eccles et al., 1999):

- the prevailing level of interest rates;
- the length of time that the development takes to complete;
- the length of time that the development takes to produce income or sell.

Using this as the basis for the development of a holding cost model, the development process and its constraints caused by timing delays may be summarised thus:

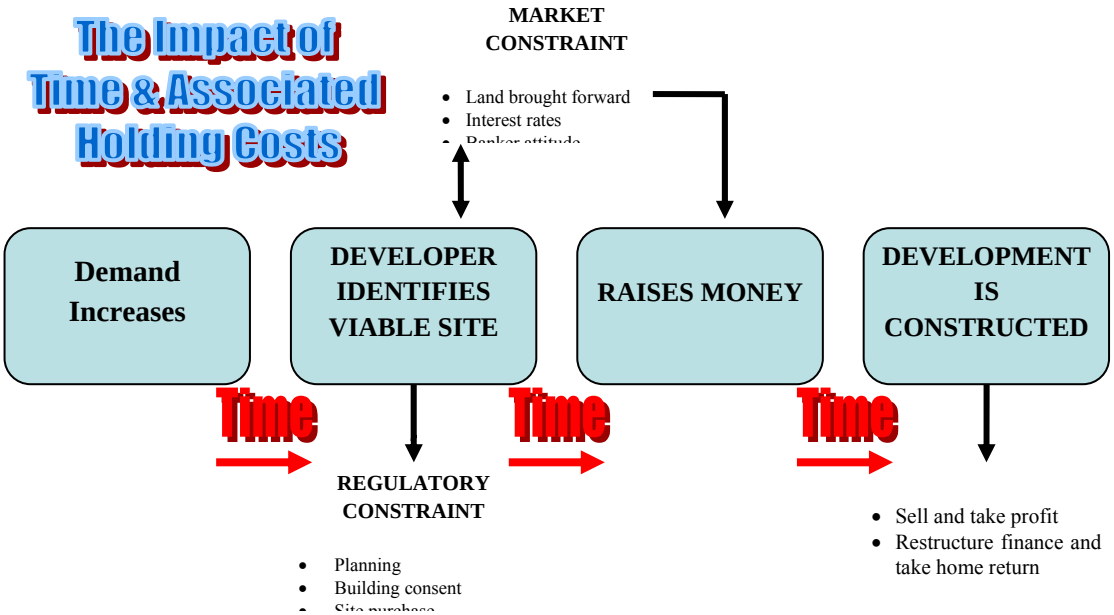


Figure 2-3 The Impact of Time & Associated Holding Costs

As a minimum, holding costs will relate to at least the rate applicable to the funding of a development project, according to the nature of the Project. The generally accepted principle or assumption is that the development moneys will be outstanding for an average of half the period during which the estate is being developed and sold. Assuming a two year life (this obviously is derived from marketing studies), the interest allowance is calculated on the development costs including the contingency allowance (Whipple, 1995). Whipple, in evaluating cash flow analysis, rightly emphasises the importance of timing on the profitability of development projects. Static models ignore a sensibly conceived scenario analysis.

It is clear that while actual base assumptions might change significantly, present values could alter the calculation particularly where the timing factors run out of control. Whipple (Whipple, 1995) points out that because comparatively high money costs apply to real estate development projects, the discounting effect can become very pronounced and as a consequence the timing factor is of paramount importance. Therefore, a successful real estate development (financially speaking) is largely a product of the professionalism with which cash flow are timed.

2.3.11 OPPORTUNITY COST, AND THE COST OF EQUITY

The return that ordinary shareholders can obtain from the best alternative investment of equal risk and maturity can also be viewed as an opportunity cost (Bishop et al., 2004, pp. 447-448). As pointed out by Bishop (2004), unlike other forms of financing, ordinary shares do not have an explicit rate of return or interest rate. Accordingly, whether ordinary shareholders funds come from retained earnings or the issue of new shares, there exists an opportunity cost. This can be demonstrated in the CAPM model which provides the means to estimate the cost of equity, viz;

Equation 2-11

$$\bar{r}_e = r_f + \beta_e [\bar{r}_m - r_f] \quad =$$

where $\bar{r}_e$ is the cost of equity

r_f is the risk free rate of return

β_e Is the Beta of ordinary shares, a measure of its risk

$[\bar{r}_m - r_f]$ Is the market risk premium

2.3.12 TAXATION AND LIQUIDITY EFFECTS

Other factors might also be included under the general ambit of "holding costs". For example, land taxes may not be neutral in their economic impacts due to liquidity effects. Liquidity effects of land taxes may be in the form of holding cost effects or capitalization effects (Bourassa, 1992). Bourassa also recognises that "holding cost" effects may occur when land is being withheld from development for non-financial reasons, such as the direct benefits of land ownership. Such non-financial reasons might also include processing delays by approving bodies and other planning matters that impact on time. Capitalization effects may occur when there are imperfections in capital markets which prevent the acquisition of land for otherwise viable projects.

This augurs well with earlier work completed (Bourassa, 1988) which examines the liquidity effect results from increases in the rate applied to land. The incentive effect is due simply to the increase in supply that occurs as the excise effect of the tax is reduced. The liquidity effect has two components. One is the effect on current landowners, who must bear increased holding costs and who are thereby

encouraged to improve their properties or sell to someone who will. The other component is the obverse of increased holding costs and is due to capitalization of the tax in land value. Reduced land values make it easier for potential developers to acquire land.

Bourassa in his later analysis proceeds to examine the other economic impacts of taxes on land and concludes that the effect on current landowners, who must bear holding costs in the form of land taxes, are thereby encouraged to improve their properties to maximize return on investment or sell to someone who will do so. The other component of the liquidity effect is simply the obverse of increased holding costs; nonetheless economists generally agreeing that increases in taxes on land result in decreases in land value. The assumption though would always be that imperfect capital markets are preventing developers from obtaining sufficient capital for land purchases for otherwise viable development projects. This is largely an empirical question (Bourassa, 1992).

2.3.13 THE IMPACT OF HIGHLY REGULATED ENVIRONMENTS AND COMMERCIAL RISK

The correlation between land supply restrictions and affordability may be logically explained by the assertion that holding costs inevitably reside alongside increased time taken for regulators to process development applications. However, some researchers (Gurran et al., 2007) have compared outcomes achieved in levels of affordable housing in the UK and Netherlands as against Australia and North America, concluding that a *strong* government role (as against the *quantum* of government involvement) in urban policy and land regulation can explain the achievement of *higher* levels of affordable housing. This seems to augur with Tse's conclusions for the Hong Kong market (Tse, 1998) where it was demonstrated that the imposition of more "land-sales restrictions" by government will actually lower the level of land prices.

Successful policy interventions are likely to require an appropriate mixture of policy types, rather than placing undue reliance on a single type of policy. Market regulation through development control and management and building regulations certainly has a role to play in influencing market behaviour, but it would be mistaken to rely on regulation to change market cultures (David, 2008). It is argued here that

the case of residential development highlights the need for a broad and holistic understanding of how the regulatory environment created by planning and building regulations interacts with land and property markets. It would be erroneous to concentrate too narrowly on immediate market regulation and neglect the ways in which policies which seek to shape or stimulate the market have important and sometimes unexpected consequences on markets structures and cultures.

In consideration of the above, it is submitted that whilst a link exists between the delays experienced in obtaining planning approvals, and housing affordability, that link – although likely - does not necessarily establish itself as a holding cost.

It may also be contended that delays in the production process also lead to reduced or cancelled financial returns due to substantial holding costs. A recent UDIA commissioned report (Walker et al., 2008) suggest that like all industries, time is of the essence to the land development business – however the commercial requirements of the land development industry often are not appreciated. It is held that developers only have a finite set of options available to them which define the commercial requirements of land developments. These options include: continuation to develop residential product at significantly reduced profitability (or potential loss); project deferral until such time that market conditions support sustainable sales rates at price points that ensure a viable project; and finally to on-sell the project to a third party prepared to take on the risk. Walker suggests these responses are not land banking, nor do they represent deliberate attempts to drive up land prices. It is suggested that *"these actions are legitimate commercial responses to the need to produce lots in a viable manner"*.

2.3.14 THE DIMENSIONS OF REGULATORY ASSESSMENT IN THE GREENFIELD RESIDENTIAL DEVELOPMENT PIPELINE: A PRIMARY COMPONENT OF HOLDING COSTS AND A KEY FACTOR AFFECTING HOUSING AFFORDABILITY.

Regulatory Assessment as a holding cost variable

It is suggested that the quantum of time taken by regulatory authorities to assess and consider applications for a particular development represents part of the holding cost calculation. In many instances it may even be demonstrated to represent the major component of holding costs. If the foregoing can be proven then there is a clear relationship with housing affordability. However, these costs are not always

well informed or clarified even though they are often noted as impacting housing affordability. As observed recently (*National Housing Supply Council - State of Supply Report*, 2009) the relationship between housing costs and planning regulations, charges and procedural requirements—including the impact of planning controls on the responsiveness of supply - has been raised regularly in the course of inquiries into housing affordability. The NHSC report indicates examples such as the Department of Community Services and Health, National Housing Strategy, AGPS, Canberra, 1991 and, more recently, the Productivity Commission (Productivity Commission, First home ownership) and the Senate Select Committee on Housing Affordability in Australia (Senate Select Committee on Housing Affordability in Australia, *A good house is hard to find*), June 2008.

However, many of these reports struggle to quantify various components, and in particular they are unclear in identifying holding cost components. Although research is emerging in these areas - the most significant recent example being AHURI (Gurran et al., 2008) - there have been only limited attempts to quantify the relative weight of such costs, or otherwise examine the proportionate cost to a development project and ultimately determine impact on housing affordability. The AHURI report referred to (a positioning paper) recognises that whilst there is a growing body of research and literature addressing the indirect impacts of the planning system on the land and housing market, particularly the link between land use planning and housing supply, within this broad field of work little attempt has been made to quantify the direct costs to housing development arising from government taxes and planning regulations The best estimate provided in that Report supports assertions by the sector that taxes, levies and compliance costs now amount to about a third of the cost of new house and land packages, including costs of meeting planning regulations and holding costs associated with the approval process (Gurran et al., 2008). It is reported that the RDC quantifies the impact of land supply limitations at "just under $30,000 to the price of a block of land" (*Residential Development Cost Benchmarking Study*, 2006), although Gurran notes the methodology for deriving this figure and the jurisdiction to which it applies is unclear.

Furthermore, it is observed that currently there is no comparative source of data on planning regulations across Australian local government jurisdictions, with

such estimates therefore *"impressionistic at best"*. The collecting of necessary regulatory data to enable such research in Australia is therefore *"considered to be a priority for better understanding the relationships between broader urban planning policy settings and house price and affordability outcomes"* (Gurran et al., 2008). The final AHURI report (Gurran et al., 2009) entitled *"Counting the costs: planning requirements, infrastructure contributions, and residential development in Australia"* incorporated a case study design for the empirical research phase that provided for the calculation of both "time" and "holding cost" against a generic fee schedule containing each process cost, building or development control requirement, and other planning related costs or charges. Unfortunately, researchers were unable to conduct this empirical research which may have shed light on the range of holding costs (amongst other matters), under differing geographical scenarios[7]. The report had intended to devote a significant portion of analysis on planning regulation costs and impacts across the Australian states and territories, focussing on a sample of representative case studies in NSW, Queensland, and Victoria. However, the overall analysis of planning costs was limited by a lack of financial data provided by the sample of case study developers. The researchers comment that *"In itself, this inability or unwillingness to provide specific cost data on planning related expenses supports claims that this information is difficult to ascertain with certainty, but challenges claims that such costs are added directly to the price of a completed home. Our case study interviews revealed that, when faced with uncertainty and system opacity, developers choose to avoid certain local government areas, reduce development activity, postpone land acquisition, or target higher market segments"*.

The full RDC report referred to previously (*Improving Housing Affordability in NSW - A Plan for Industry and Government*, 2006) acknowledges the time cost of excessive delays in gaining development approval is a significant cost with significant blow-outs in the timeframe to process applications. However, whilst

[7] It is acknowledged that the primary research objective of this project was designed "to understand the relationships between urban planning regulation and housing outcomes in Australia, focusing particularly on the cost impact of planning regulations for housing development" (Gurran et al., 2009, p. 9). The matter of holding costs, whilst an important element of the study, was not critical for determining outcomes.

observing that holding costs (interest costs, rates, land tax etc) increase in line with the amount of time it takes to prepare and assess development approvals (and therefore upward pressures being placed on the sale prices to new home buyers), the calculation methodology is not transparent. Somewhat paradoxically, the report states that "these costs have previously been hidden from discussions on housing affordability".

Regardless, the scale and nature of a proposed development will determine the complexity and nature of the application required, and the quantum of information included in the application. Whilst the process itself does obviously vary from region to region, the general principle is that of giving legislative power to a procedure that compares what is being proposed, against a set of guidelines or criteria. For example, in Queensland, Australia, this process is determined by the "Integrated Planning Act 1997 (IPA)", with the lodgement of a Development Application (DA) being a requirement for all forms of development including, for example, carrying out building work , operational work , reconfiguring a lot or making a material change of use (Garner, G. O. & Layton, 2008). The Integrated Development Assessment System (IDAS) is the system established under the IPA to manage the lodgement and assessment of most development related activities. When submitting a DA, applicants must demonstrate how a proposal satisfies the Development Vision, Performance Criteria and Performance Standards contained in the Development Guidelines.

Government Taxes & Planning Regulations Impact on Housing Affordability

Quantifying the impact of holding costs on housing affordability has a particular focus on the consequences of extended assessment periods as a component of holding costs. This is becoming more apparent as a fundamental component in seeking to clarify the impact of holding costs on housing affordability. Understanding this effect complements other research recently emerging in the area of statutory urban planning economic impacts. For example, a recent study (Gurran et al., 2008) examined the *"…often unpredictable costs that arise from planned intervention in the land and housing market, direct costs associated with complying with building and design controls, time taken to secure approval, and fees and charges for administration, infrastructure or other public services associated with*

development". The Gurran study was predicated on an observation that little attempt has been made to quantify the direct costs to housing development arising from government taxes and planning regulations. However, this lack of quantifiable data applies even more so in the area of indirect costs. Yet it is hypothesised that it is these costs which may have the greatest impact.

This position is supported by a PCA[8] report (*Reasons to be fearful? Government taxes, charges and compliance costs and their impact on housing affordability. Residential Development Costs Benchmarking Study*, 2006) which strongly challenges conventional thinking that housing prices are primarily driven by issues such as interest rates, supply and demand, and consumer confidence. It found that the combined impact of various government costs represents the second most expensive part of the cost of developing new housing product (more costly even than the land), This report also observes a steep rise in the tax and compliance bill for new home buyers, particularly since 2000. These costs have been identified as not only being the more visible costs such as new and increased infrastructure charges and rising compliance costs, but also the less visible holding costs caused by excessively complex development assessment procedures, lengthening delays by statutory bodies, and other related factors.

Another PCA report investigated changes in infrastructure charges in Brisbane, Sydney and Melbourne between 1995 and 2006 (*National Housing Infrastructure Costs Study*, 2006). Total infrastructure charges for new houses in Brisbane (Forest Lake) were estimated at $17,128 in 2006, a 279% increase from 1995, or 145% above the rate of inflation. This study claimed to examine how government imposed infrastructure charges impact house and land prices and hence affordability. However, in this instance, "indirect" infrastructure costs did not include holding charge calculations. Rather, this referred to infrastructure charged for but which is not 'essential' to the delivery of a home site (for example, an infrastructure feature which is of benefit to a broader community).

[8] Property Council of Australia - Residential Development Council – independent report prepared by consultants UrbisJHD

It is subsequently noted that some ambiguity exists in terms of the contribution of various costs. This is recognised by the Local Government Association in their report (*Breakdown of Housing Costs in South-East Queensland*, 2008) whom calculate that whilst house construction is the largest cost component (at 41-43% on average), finished land costs, comprising undeveloped land purchase and development costs is the next largest at 20-21% on average, with infrastructure charges, comprising water, sewerage, stormwater, transport, community and parklands contributions, are estimated at 4% on average. However, the calculation of holding costs is not undertaken in this and other similar studies. Therefore, in relation to elements related to holding costs, significant questions arise particularly in relation to determining the size of their impact. Other matters requiring clarification include to what extent are regulatory controls or assessments a contributor of total holding costs? Can the effect of these elements be measured in terms of impact on the end user? Is it therefore possible to model the impact of holding costs upon affordability? What are the implications for regulatory authorities?

The Residential Development Pipeline

In Queensland, the Development Application process forms part of the "Residential Development Pipeline", as detailed at Figure 2-4. There are a number of stages identified in this pipeline, ranging from "Broadhectare Land" identification and Lot Approval, through to dwelling approval and completion. In this model, developed by the Queensland Government (Department of Infrastructure & Planning), no time-frames are provided, however this model expands upon the earlier (Eccles et al., 1999) development process model outlined earlier in this thesis.

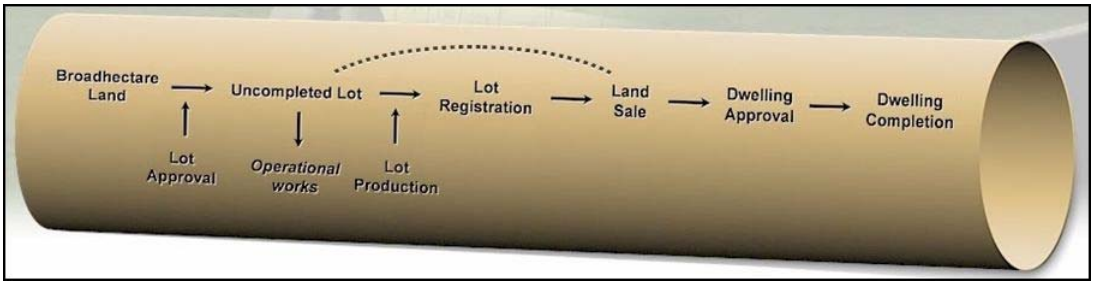


Figure 2-4 - Residential Development Pipeline. (Barker, 2008)

A more comprehensive development pipeline model suggests a six stage generic development pipeline for greenfield development and major brownfield

redevelopment (*National Housing Supply Council - State of Supply Report*, 2009). In terms of generic pipeline modelling, it fills in a few gaps evident in the Queensland Government model, including provision for Gazettal of rezoning/ material change of use, and Negotiation of infrastructure levies and detailed structure planning.

The National Housing Supply Council's Report focuses on housing supply and demand (including projections of underlying demand and of land and housing supply over the next 20 years), affordability issues for lower income households, and data collection and methodology (including the need for more sophisticated modelling). With this latter point in mind, it has not attempted quantification of holding costs, yet recognises their existence throughout the development pipeline process which is stated to range from 6.25 years to 14.5 years, the detail which is summarised in Table 2-3 NHSC Development Pipeline (Summary) as follows:

Table 2-3 NHSC Development Pipeline (Summary)

Stage	**Time Period**	**Notes**
1. Strategic identification and designation of new land release area	2–4 years Time frames vary widely	The designation by a state or territory planning agency that a parcel of land or an area may have urban development potential is generally by inclusion in an urban growth boundary or in Queensland, identification of master planned area. May also include preparation of a broad strategic plan for the land.
2. Gazettal of rezoning/ material change of use	1–3 years depends on scale and complexity.	Rezoning and/or material change of use process is common to most States.
3. Negotiation of infrastructure levies and detailed structure planning	1–3 years involvement of a number of State government departments and agencies may significant impact applications proceeding	The preparation of a development plan or structure plan comprises more detailed site planning for the land and may include determination of development contributions. The
4. Statutory subdivision and development approval	6 months – 2 years	The issue of statutory development/subdivision approvals - usually relate to road layouts, lot sizes and dimensions - sometimes streetscapes and house designs (integrated housing projects)
5. Major civil works, servicing	1–2 years	Usually commences with the commissioning of engineering designs for the civil construction of

Stage	Time Period	Notes
of allotments and issue of new titles	Subdivisions generally constructed in stages of around 50 lots and development of a large subdivision may occur over a number of years	the subdivision and the provision of services. The completion and certification of the construction works by approval agencies is usually a condition precedent to the issue of titles to the new residential lots.
6. Development approvals and dwelling construction	9–12 months \Overall time frames vary widely	Housing design, approval and construction - may be undertaken by a lot purchaser or by a developer/builder who intends to offer a house and land package. from as little as nine months to twelve months.

Source: NHSC (*National Housing Supply Council - State of Supply Report*, 2009)

As well as development application or administration fees and any contributions they may make for physical and social infrastructure, developers also incur expenses in participating in the planning process, through staff time and site holding costs while approval is sought. Interest must be paid on these expenses until projects are completed and sold (*National Housing Supply Council - State of Supply Report*, 2009). This represents a key component of holding cost. NHSC also comment that extended development delivery time frames can increase risks for investors, given the cyclical nature of demand factors such as immigration and interest rates, and supply factors such as availability of credit. In addition, there is always scope for unforeseen changes in the policy environment that may affect final pricing. All these factors impact holding costs, further complicated by the developers choosing to hold land or delay the approvals process for a range of reasons. This could include awaiting information on infrastructure developments, project redesign, changed market conditions and decisions about staging land release.

From the aforementioned three models (Eccles, PIFU and NHSC), a Generic Greenfield Property Development Pipeline can be developed in an effort to gain understanding as to the generic stages likely to be encountered regardless of geographical location, and the expected timeframes applicable for each step. This is summarised at Figure 2-5 below and further detailed in the Appendix at Figure 6-2 Generic Property Development Pipeline.

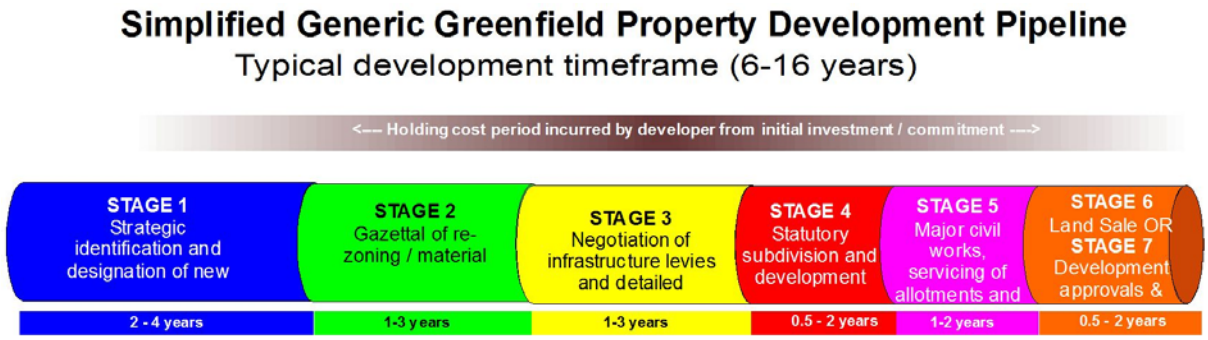


Figure 2-5- Simplified Property Development Pipeline.

Adapted by the author from sources modelled by Qld & Federal Australian Governments & Eccles (Barker, 2008; Eccles et al., 1999; National Housing Supply Council - State of Supply Report, 2009)

With a typical total development timeframe lasting somewhere from six to sixteen years as indicated by the above graphic, this might translate to a typical holding cost period from between four to twelve years. These periods will inevitably be site specific, with the holding cost period relating to a point of commencement aligned with initial investment commitment (occurring somewhere between stages 1 and 2), and concluding upon sale realisation for the whole investment (occurring somewhere between stages 6 and 8). Note in the above graphic (Figure 2-5) the holding cost period is to an extent indeterminate at the extremities (thus the timeline bar fades at either end); at least in the generic model. This can only be fully determined on a site by site basis.

These time variations alone, superimposed by interest rate variations over the time period and the time required for full realisation, all contribute to the difficulty in arriving at a rigorously computed holding cost calculation(s). Tranched financial arrangements for land acquisition, re-financing during the course of a land development project (typically undertaken especially in the case of larger projects), and various market constraints additional to those mentioned, all add further complexity. This final matrix is represented at the appended Table 6-3 The Generic Greenfield Property Development Pipeline & The Impact of Time.

Larger greenfield projects will also typically encompass both direct land sales, and combined house / land sales – the latter constructed by the developer offering a house and land package. This typically involved strategic marketing approach. In some instances, notwithstanding the holding costs, it is better commercially to wait for more favourable economic conditions which will support selling points that

represent sustainable levels of profitability (Walker et al., 2008). In addition, difficulties in establishing agreement over what a realistic infrastructure contribution fee should be, particularly in regards to altered development yields, also represents potential delays. Walker also highlights instances where a lack of infrastructure led to delays in the development of the entire project. The consequence of this is that while some portion of a project could proceed, a number of lots would be held back until the appropriate water and sewerage or similar infrastructure were in place.

All these variations must be taken into account as part of the holding cost calculation, inferring the calculation of a series of present value calculations over even modest land development projects.

2.3.15 THE IMPACT OF LAND SUPPLY

Another perspective is the extent of house price volatility due to restriction, or otherwise, of land supply by governments. Commonly referred to as "land banking behaviour", this strategy impacts not only the behaviour of property developers, but also housing prices – and therefore, affordability. The importance of this may be appreciated by considering the likely impact that a significant decrease in lot supply or availability might prove. For example in Brisbane there was a 48% decrease in residential lot approvals in the year to the March quarter 2009 – representing a fall from 2,903 lots to only 1,521 residential lots in the same period this year (*Residential land activity fact sheet - March quarter 2009*, 2009). Whether this constitutes a propensity towards land banking behaviour may be argued, however research (Tse, 1998) has demonstrated that land banking behaviour is inevitably governed by economic conditions. In uncertain economic conditions, there may be greater uncertainty about future housing price appreciation which could actually have a negative effect upon the land-holding costs. Tse supports the argument that *uncertainty increases the expected future value of the vacant land*. In addition, larger developers tend to spend more time and resources devoted to land acquisition. Further, that in the real estate industry, skills in land purchase and timing completions to maximise gains from house price inflation tend to be more important than the ability to compete through technical innovation. The inevitable conclusion reached is that by marketing lots sooner, and pocketing the money sooner, developers can reduce borrowing costs and fund new projects.

In examining these issues, Tse calculates an equation that long-term land holding costs should cover interest costs on the basis that the amount of land sales by the government and land in developers' land banks tend to decrease when market interest rates increase.

The conclusion reached here is that *the rate of interest can be viewed as a kind of land-holding cost*, since a developer's optimal amount of land bank occurs when the expected marginal rate of return of land holdings equals the rate of interest. This has been expressed (Tse, 1998) as follows:

Equation 2-12

$$\max_{L,A} k = \frac{\theta(A) - rL}{A - L}, \quad s.t. \quad A > L$$

Where: k = rate of return

L = loan amount

A = amount of land in land bank

$\theta(A)$ = expected return from holding (A) amount of land in land bank

R = interest rate to finance land holdings

Thus, the maximisation of the rate of return on equity is a result of choosing both the amount of land in a land bank, and the amount of loan.

Tse also raises the question of *uncertainty* as a probable impactor on holding costs. A negative effect could be achieved where greater uncertainty about future housing price appreciation occurs (i.e. the expected future value of vacant land increases); whilst uncertainty about future increases in construction costs makes the vacant land relatively less valuable – making the decision to develop the land at the current time relatively more attractive.

Constraints of planning decisions cleanly impact the supply equation. Such constraints have been described to typically include transport, infrastructure, environmental impact, competing land uses, and construction capacity (Tse, 1998). However, these constraints are not applied uniformly and an argument exists that the amount of available land, and the supply of housing, may at time relate to political

considerations outside of what might be otherwise justified by analysing population and household growth. This leads Tse to conclude that not only land supply, but also planning controls, development processes and marketing practices are important determinants of housing supply.

According to a Property Council commissioned report (*Australia's Land Supply Crisis - Supply/demand imbalance and its impact on declining housing affordability. Summary report: Australian Broad Hectare Land Supply Study*, 2007), the worsening level of demand supply imbalance in the Sydney market is due to a number of factors including lack of long term supply which has dented confidence in the Sydney market with price 'holding' having driven consumers away. These are said to be aside from ongoing problems with infrastructure provision and the imposition of development levies has restricted supply; and social, environmental and economic issues and community and political opposition to housing growth. This supports the argument that for an efficient land supply market to exist, for supply to keep pace with but not exceed demand, then the sum of the supply side inputs must be equal to the equilibrium or market price (Bryant, 2010, p. 16). A variation of this theme (Eves et al., 2008, p. 9) suggests that increasing the total potential supply shifts the anchor point which rotates the supply curve down around the origin, and shifts the Equilibrium along the Demand Curve. Given the relatively elastic nature of demand over the vast majority of the feasible demand, large increases/(decreases) in total potential supply will, *ceteris paribus*, generate relatively small decreases/(increases) in Equilibrium Price. The conclusion here (Eves et al., 2008, p. 13) is that even large shifts in supply have relatively little effect on the equilibrium (market) price and quantity sold – i.e. governments should not expect to be able to lower housing prices by adding reasonable numbers of units to the housing stock.

Again, while much research over the years has looked at planning from a political economy perspective there is increasing interest in bringing an evolutionary economics approach to the analysis of land and property markets. According to a University of Glasgow report (David, 2008) few researchers have systematically employed a political economy approach to investigate the interaction between planning policy and property markets. The current state of science is thus said to be heavily reliant on neo-classical approaches to understanding this interaction, with some interesting recent contributions from within new institutional economics.

However, as pointed out by David (2008), the concept of an efficient market with perfect information is a theoretical rather than a practical one. Much would depend on the clarity and certainty of any policy shift and the extent to which market operators received and transmitted unambiguous signals about it. In the short term, policies that impose extra costs on developers, especially at a time of relatively static prices, may lead to reduced development output. A clear policy environment that enables developers to pass extra costs on to landowners in the form of reduced land values is essential to avoid this in the long term.

In some ways this supports the contention that holding costs may at times work somewhat in reverse to what would normally be expected. For example, market fluctuations may also impact on the viability of lot releases resulting in an amended staged release or holding back of lots until a positive return can be realistically anticipated (Walker et al., 2008). Therefore, the opportunity "cost" of holding may become an opportunistic gain; however this ignores risk since holding lots longer prior to release may not always produce a positive result.

2.4 SUMMARY AND IMPLICATIONS

Holding costs in property development are varied in both form and in their computation, however ultimately they always relate to those costs incurred during various phases in the development pipeline – from instigation (strategic identification) to project completion (sale and / or construction completion). This period can range anywhere up to sixteen years and even beyond. Often depending upon the length of time taken for regulatory assessment, it can equally can be affected by land banking behaviour of key stakeholders, funding structure and availability, and many other factors. Regardless of the reason, time is of considerable importance and is a pervasive influence in holding costs computation. Time also provides a foundation for increased complexity since holding costs can occur at any time or stage, or along the whole breadth of the property development process.

Holding costs are also not always immediately visible. Yet, holding costs represent a major determinate of value, and frequently become a crucial determinate of project viability. This is especially so in the case of larger, more complex greenfield property developments. Holding costs routinely have an apparently

stochastic behaviour; however quantitative determination is possible with a more consistent approach than might be evident in the literature which exposes considerable lack of uniformity.

Holding costs that typically occur in the case of greenfield housing property developments include the opportunity cost of funds invested in the acquisition / purchase, costs associated with legal's and settlement, rates and land, property maintenance costs during development, insurances and various other services. They may be thought of "opportunity lost", or in broad terms, "opportunity cost".

Various models are utilised for both defining and measuring holding costs. Whilst most ultimately rely upon derivations of the Present Value / discounting approach, the application of these "first principles" varies widely despite general agreement in the literature that the discount rate (or rate of return) represents the opportunity cost of capital. As a result, the methodology used in calculating holding costs also has wide variation. This includes the selection of applicable interest or discount rate to be used, and whether or not inflation needs to be taken into account.

With regards discount rate selection, a range of capital budgeting concepts such as the Weighted Average Cost of Capital (WACC), whilst useful in analysing project financing feasibilities, are not always representative of computations that reliably underpin holding cost calculations. This is because of their failure to have application in hyperinflationary conditions whereby the opportunity cost of holding is best represented by the rate of inflation. Although such periods are rare, i.e. where the inflation rate exceeds the nominal rate of interest, it can be argued that the holding costs in this instance is greater than the applicable interest rate.

Furthermore, on many occasions, the methodology utilised for calculating holding costs is not readily apparent, including disclosure of major assumptive variables such as interest rate(s) and timing. This lack of information makes it difficult to determine the degree of rigour that has been applied, thus confidence in the derived outcomes is severely compromised. Even commercially available software applications, whilst incorporating holding cost calculations within their models, do not fully disclose these costs as a separately identifiable item(s).

In some instances, holding costs are even completely ignored in determining the total costs involved in the development pipeline. Difficulties in their calculation

are typically due to uncertain or imprecise timelines, as well as the additional complexity of holding cost methodology, liquidity effects and other aspects. Whilst a generic development pipeline model can be considered, it is apparent that wide variations exist in the nature of holding costs which have great dependency on site specific variables. This complexity in deriving holding cost calculation may therefore explain why commentators usually provide vague or even no detail when applying holding cost theory to support public policy, or specific land development projects.

Despite this lack of detail, significant resources have been poured into policies designed to specifically inhibit the holding cost effect in Australia as part of addressing the broader issue of housing affordability. In the case of Queensland, this includes the implementation of the Queensland Housing Affordability Strategy, and the creation of the Urban Land Development Authority.

Whilst recognising that holding costs are only one contributor to the housing affordability equation, there needs to be significantly more research into its underlying nature and effects, and in particular an analysis over time. The need for a broadly based analysis by regions and towns in Australia, i.e. empirical case study analysis, cross-referencing with a rigorous international comparison study, is indicated. Additional consideration of further market and non-market variables and their likely impact on housing affordability would also be required in order to assist in determining the total impact of holding costs.

Chapter 3: Research Design

This chapter describes the design adopted by this research to achieve the aims and objectives stated in section 1.3 of Chapter 1, i.e.:

1. To establish the nature and composition of holding costs over time, as related to residential property in Australia, and internationally.
2. To examine the linkages that may exist between various planning instruments, the length of regulatory assessment periods, and housing affordability.
3. To develop a model that quantifies the impact of holding costs on housing affordability in Australia, with a particular focus on the consequences of extended assessment periods as a component of holding costs; thus, provide clarification as to the impact of holding costs on overall housing affordability.

In this Chapter, Section 3.1 discusses the methodology used in the study, the stages by which the methodology will be implemented, and the research design; section 3.2 details the participants in the study; section 3.3 lists all the instruments used in the study and justifies their use; section 3.4 outlines the procedure used and the timeline for completion of each stage of the study; section 3.5 discusses how the data will be analysed; and finally, section 3.6 discusses the ethical considerations of the research and its potential problems and limitations.

3.1 METHODOLOGY AND RESEARCH DESIGN

3.1.1 METHODOLOGY

The investigation proposes to initially examine the nature and composition of holding costs over time, as related to residential property in Australia. From there, establish linkages that may exist between holding costs components and other variables such as various planning instruments, the length of regulatory assessment periods, and housing affordability.

A literature review on the definition and measurement of housing affordability provides a suitable platform upon which the nature and composition of holding costs can be examined. Proceeding to evaluate the length of the regulatory assessment period and the extent of correlation with holding costs paves the way to examine the extent and linkages of the assessment period as a contributor impacting on housing costs, and therefore affordability. Holding cost theory and the imputation of holding cost components are examined prior to the modelling of assessment periods against apparent holding costs. The latter assists in establishing evidentiary links with housing affordability.

The development of a preliminary model sets an appropriate background for proceeding with additional statistical analysis capable of reliably presenting predictive models that quantify the impact of planning delays, and other holding cost variables. The data modelling component will assist in establishing links between various factors, in particular between holding costs and the length of regulatory assessment periods. As a consequence, some clarification of the impacts on housing affordability will be established.

The end result is the development of an economic model quantifying the impacts of holding costs on housing affordability. This model is designed with a need to develop an understanding of how to maximise the opportunities available by policy makers in mind.

The methodology used in the commencement of this study is in part experimental (particularly during the development of a preliminary economic model) since it is based on casual-comparative analysis of holding cost components. Following this the investigation will devolve to correlational research based on case study analysis. Each stage of the research links to the research questions as follows (note that most stages are to some extent concurrent, rather than sequential, as represented diagrammatically at Figure 3.1):

Stage 1 – Primary Literature Review and Desktop Study

Links to Research Questions 1, 2, and partially 3:

1. *What is the nature and composition of holding costs applying in Australian and international residential property markets? Is the matrix relatively static, or changing over time?*
2. *In relation to property, and property (residential real estate) development, what are the prevailing planning and statutory regulations utilised in Australia and internationally?*

Which (if any) of these instruments are used to support affordable housing concepts, and which (if any) of these instruments represent part of the holding cost matrix? In the context of housing affordability, has any public or private planning tool been identified in the literature as being more effective, or more destructive, than any other?

3. *What is the extent and variability of regulatory assessment periods in Australia and internationally? Does the length of the regulatory assessment period impact holding costs?*

The primary literature review and desktop study investigates the key issues, and identifies holding cost components. A special emphasis is given towards any research conducted that gives rise to linkages established with housing affordability, mortgage stress and / or associated issues, and any ensuing apparent financial impacts.

Stage 2 – Ongoing literature review

Links to Research Questions as for Stage 1 (above), in addition to partially Question 4:

4. *As a result of the above, can it be established that the assessment period is a contributor impacting housing affordability? To what extent, and what are the linkages? What are the policy implications, e.g. does the evidence exist to demonstrate that changes to the framework used in Australian or overseas jurisdictions might result in promoting or retaining affordable housing?*

The ongoing literature review provides the opportunity to evaluate concepts, theories and arguments taken from the literature. It ensures a robust dissertation. By undertaking this on an ongoing basis throughout the whole research process, it will ensure the research builds on work already completed in the field of study.

Stage 3 – Preliminary Data Analysis & Interrogation

Links to Research Question 5 and the development of a preliminary economic model:

5. *Can a model be developed in the light of the foregoing to quantify the impacts of holding costs, focussing on the timing of assessment periods, in relation to housing affordability - or otherwise maximise the opportunities for affordable housing?*

The Preliminary Data Analysis & Interrogation stage involves the examination of holding cost theory, anticipated to assist in the development of new concepts leading to the development of economic (theoretical) spreadsheet model for holding costs. This stage may also include the identification of other selected elements.

Stage 4 – Further evaluation and assessment / data modelling.

Links to Research Question 5 (as for Stage 3 above), allowing further more sophisticated model development.

The stage involves economic model testing and refinement. It moves on from the preliminary economic model and conducts multi-variable regression analysis (statistical analysis), i.e. the development of predictive models based on demographic and other group relationship data. Conducted mostly concurrently with Stage 5 (case study data collation), this stage also develops assessment criteria to predict holding cost outcomes and links with housing affordability.

Stage 5 – Case Studies (Field Investigation)

Links to Research Questions 2, 3, 4 and 5.

The stage involves the collation of data from at least ten development organisations, with an average five-plus developments. The analysis and interpretation of case study bases facilitates the testing of theoretical economic model against data. In this way, further refinement of the economic model is achieved

Stage 6 – Final Report

Links to all Research Questions.

The Final Report establishes the development of a model that quantifies the impacts of holding costs, and its relationship with, and linkages to, housing affordability. The report will highlight ways in which the opportunities for affordable housing can be maximised. Therefore, the aims and objectives for this research can be fulfilled, viz:

1. Establishment of the nature and composition of holding costs over time, as related to residential property in Australia, and internationally.
2. Exploration of the linkages that exist between various planning instruments, the length of regulatory assessment periods, and housing affordability.
3. The development of a model that quantifies the impact of holding costs on housing affordability in Australia, with a particular focus on the consequences of extended assessment periods as a component of holding costs.

The methodology as described, together with sequence of primary research outputs, is summarised at Figure 3-1 below:

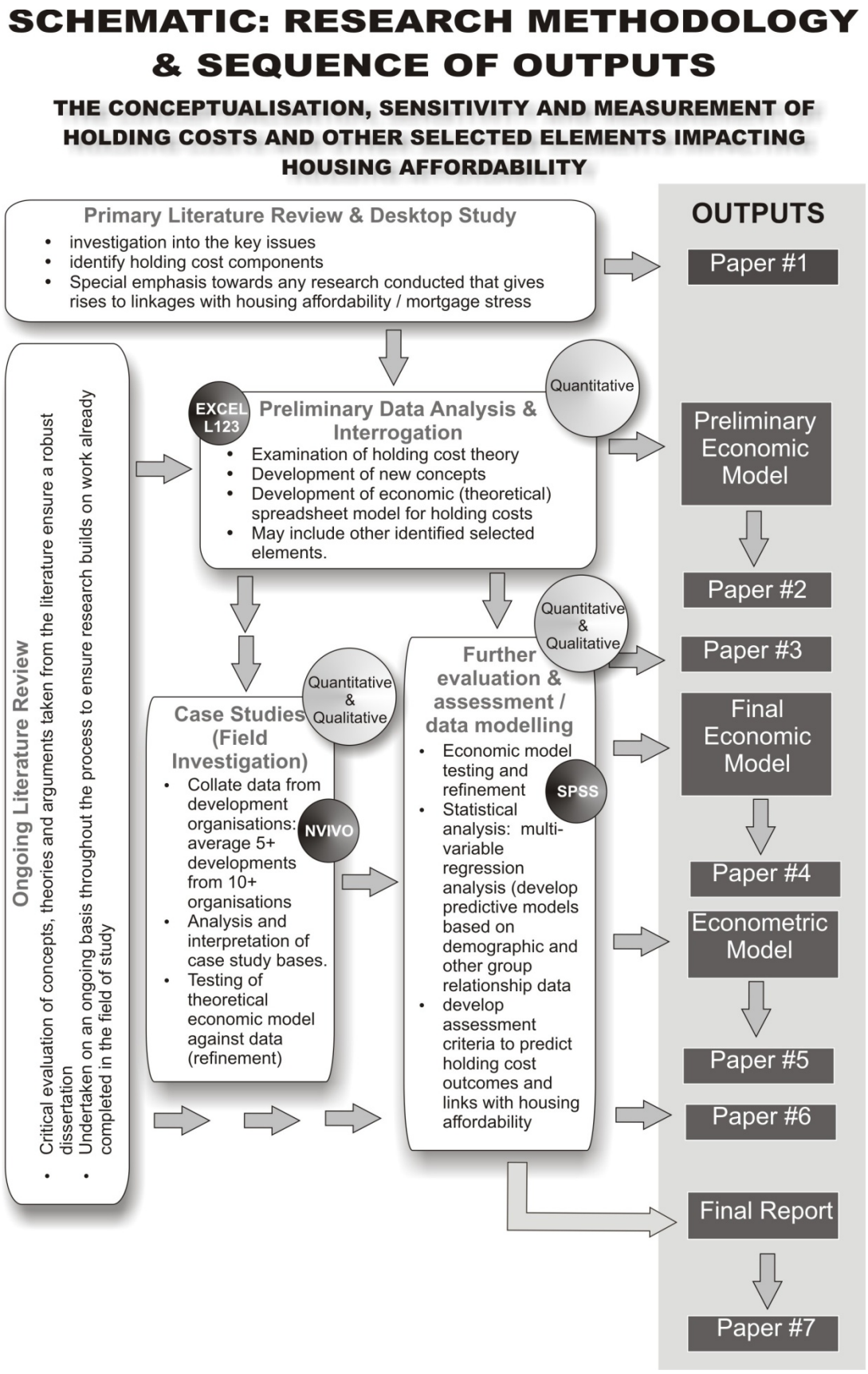


Figure 3-1 Schematic diagram showing detail of research program highlighting methodology and sequence of research output

3.1.2 RESEARCH DESIGN

Research hypothesis

The null hypothesis H_0 proposed is that ***"holding cost influences over housing affordability is in accord with widely held perceptions"***

The alternate hypothesis H_1 would suggest holding costs have a more pervasive influence over housing affordability than is thought to be widely held. Put another way, the impacts of holding costs are greater than generally acknowledged.

The objective will be to undertake statistical analysis and modelling that provides a probability value that exceeds 95%, i.e. level of significance where $p = 0.5$, as being sufficient to assert that a measured effect is representative of that in the population under test. The hypothesis will either be rejected, supported or accepted.

It is intended that statistical testing of the null hypothesis will be carried out using data derived from a number of projects undertaken by case study proponents (property developers). The case study analysis will also assist in determining, or perhaps interpreting, what is the "generally held, widely perceived impact" of the effect of holding costs, in relation to housing affordability.

Overview of Research Design

Research for this project will be both quantitative, and qualitative. The schematic at Figure 3-1 provides an overview as to how these will be conducted largely concurrently within the research program, i.e. Stage 2 (Ongoing Literature Review), Stage 4 (Further Evaluation and Assessment / data modelling) and Stage 5 (Case Studies – Field Investigations) will be conducted concomitantly.

The qualitative research will be conducted as part of the case study research (which also has a quantitative component). Aside from its own value in providing detail of perceptions held by industry participants in relation to holding costs, this research will inform the quantitative analysis by providing possible additional contenders for independent variables to be incorporated in the multi-variable regression analysis.

Quantitative Research

The quantitative research is conducted in two parts; firstly, it involves the development of an economic model that quantifies holding costs based on a set of identified components. This will be developed based on the hypothetical application of holding cost theory, for later testing using case study data.

Secondly, following development of the economic model, and the acquisition of live data through case study analysis, will be development of econometric model, utilising multiple (multivariate) regression analysis techniques. Specifically, the regression model will describe and evaluate the relationship between holding costs (dependant variable y), and a number of other variables (independent variables $X_1, X_2, X_3 \ldots\ldots, X_k$). The independent variables will be basically represented by identified holding cost components (comments follow).

The overall objective is to establish the extent of the relationship between holding costs and housing affordability (and by implication, mortgage stress), by looking at a range of explanatory variables in holding cost components such as interest rates, inflation, and time frames for statutory approvals and overall holding period(s). This is represented in Figure 3-2 below:

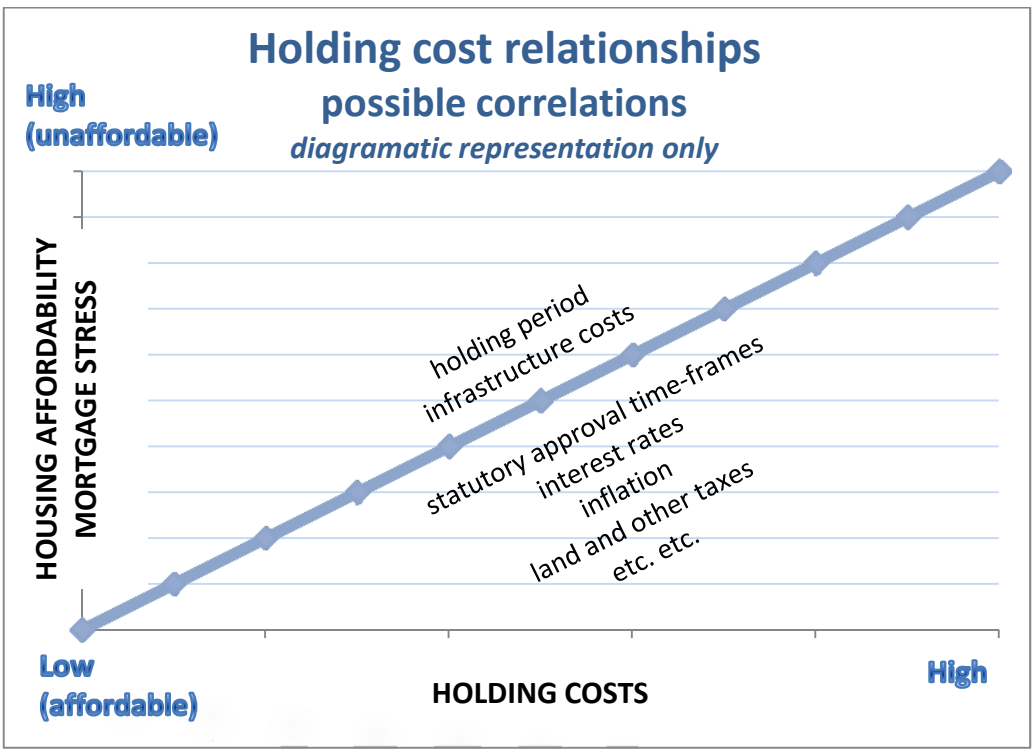


Figure 3-2 Holding cost relationships and possible correlations

The multiple regression analysis model extends the two variable model $y = \beta_0 + \beta_1 X + \epsilon_i$ assuming that the dependant variable y is a linear function of a series of independent variables x under the general formula (Pindyck & Rubinfeld, 1987, pp. 75-76; Studenmund, 2010, p. 40 and others):

Equation 3-1

$$y = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} \dots\dots\dots\dots\dots + \beta_k X_{ki} + \varepsilon_i$$

Where Y = the dependant variable (i.e. Holding Costs)

X's = independent or explanatory variables (e.g. interest rates, inflation, and time frames for statutory approvals and overall holding period(s), etc).

ε = stochastic error term

β_1 = constant or intercept of the equation (denoted β_0 in the single equation model)

$_i$ = *i*th observation

It is intended that all usual assumptions which make up the *classical multiple regression model* will be adopted, i.e. (Brooks & Tsolacos, 2010, p. 86; Pindyck & Rubinfeld, 1987, p. 76; Studenmund, 2010, p. 94 and others):

i.) The X's are non-stochastic, with no exact linear relationship existing between two or more of the independent variables (i.e. no perfect multicollinearity)

ii.) The error term has 0 expected value (mean) and constant variance for all observations (i.e. no heteroskedasticity)

iii.) Errors corresponding to different variations X are uncorrelated

iv.) The error variable is normally distributed

In conducting multiple regression analysis, it is acknowledged that one potential problem in this instance relates to potential sample size. As a general rule it is acknowledged that as the number of observations increase, the reliability of the

obtained correlations also increases. On the other hand, if the sample size is sufficiently large virtually any null hypothesis can be rejected (often a problem in finance). In real estate where, as in this case, sample sizes are often very small, a 5 per cent significance level is widely used (Brooks & Tsolacos, 2010, pp. 62-63). Another rule of thumb is that the sample size should be not less than 10 times the number of variables (Comrey & Lee, 1992), therefore indicating that a sample size of at least $n \geq 60$ is required for the proposed testing for this research project. Another rule of thumb sometimes used is that at least 30 observations are required to estimate even the simplest models, and at least 100 is desirable (Brooks & Tsolacos, 2010, p. 66). Traditionally, statisticians prefer larger sample sizes of $n \geq 200$ (Comrey & Lee, 1992, p. 200 - sample sizes of 200 rates as "fair", and 300+ rates as "good"), i.e. the more complex models rely heavily on available information and therefore require larger quantities of data. It is recognised that sampling error is minimised by increasing the size of the sample since small samples are more likely to be inherently unrepresentative.

Other problems with obtaining a small sample size relate to the nature of real estate data, in particular the infrequency of transactions, and evidence of yields, rents (if applicable) and prices. There is an additional problem related to the institutional context and the inability often experienced by researchers concerning non-disclosure of transactional details (a point not lost on AHURI researchers recently)[9], and limited market evidence.

Whilst this implies difficulties in establishing firm conclusions, and the direction of strength of the relationships between the variables, the results will be viewed cautiously and interpreted along with other evidence as may be available. Regardless, sample size will be maximised as much as possible, but if the sample size does prove to be small, then in accordance with first principles (Comrey & Lee, 1992, p. 201) the interpretation of results will be especially conservative.

[9] It was recorded by researchers that their overall analysis of planning costs was limited by a lack of financial data provided by the sample of case study developers. In itself, this inability or unwillingness to provide specific cost data on planning related expenses supports claims that this information is difficult to ascertain with certainty (Gurran et al., 2009, p. 13). This prevented scrutiny of, inter alia, holding costs, and other key variables.

In this instance, it is intended to examine the correlation of at least ten variables which are logically components of the holding cost calculation, plus testing of others, against the dependant variable holding costs. It may also be prudent, if possible, to run the same analysis against a housing affordability measurement or mortgage stress as the dependant variable, although the latter may prove difficult to acquire in terms of base line data. Regardless, this agrees with the general principle of (Comrey & Lee, 1992, p. 191) the total number of data variables included in the analysis to be at least five or six times as great as the number of factors to emerge. The more variables there are to define a factor, the more clearly it is likely to be established in the analysis.

In relation to multicollinearity, there may be issues between some variables - anticipated to be largely dependent upon the particular time period selected. One obvious example might be inflation rate, and interest rate. If this presents itself then certain methods can be employed - such as transforming the highly correlated variable into a ratio and using that as the X; ignoring it (if the model is otherwise adequate in terms of each coefficient being of a plausible magnitude); collation of additional data and / or changing the time period where possible; or even eliminating one of the collinear variables if deemed necessary.

It is also possible that a cross sectional regression model, of the kind used to explain yield differences between global real estate markets (Hollies, 2007) could be developed to assist interpretation. The output consists of a series of bivariate regressions estimated to assess the explanatory ability of determinate variables on the dependant variable. For example, for this research project a table could be developed along the following lines:

Table 3-1- Cross sectional regression table

Dependant variable		**Constant**		***X* Multiplier**	**Independent variable *X***			**Correlation coefficient**
Y	=	9.999	+	99.999	interest rate	R^2	=	0.00
Y	=	9.999	+	99.999	Inflation	R^2	=	0.00
Y	=	9.999	+	99.999	statutory approval time period	R^2	=	0.00
Y	=	9.999	+	99.999	holding period	R^2	=	0.00
Y	=	9.999	+	99.999	... etc. etc	R^2	=	0.00

Finally, if a linear regression model is found to be not appropriate because the regression function is curvilinear (nonlinear), the employment of a second degree polynomial regression function may be indicated. The decision to transform into another form such as binomial or multinomial probit or logit models will be based upon the interpretation of an incorrect functional form. This will be obviated by the observation of poor fit, difficulty in interpretation, and / or having established the possibility of biased estimates.

Quantitative research conducted in connection with field investigations

The quantitative material collected during the course of field investigations will consist of capital and other outlays incurred during development phase of greenfield property developments. This consists essentially of holding cost components as identified in other sections of this report, however it is intended to collect any outlay or financial commitment undertaken or incurred either during the development phase, or as part of the development phase.

In accordance with methodology developed by AHURI (Gurran et al., 2008), each developer will be asked to provide financial data relating to the development. Financial data will be compiled and analysed against standard development costings methodology to arrive at a quantitative dollar amount against each cost item, as well as an indicative percentage of total expenditure associated with planning approval and expenditure as a total of project cost. Two types of cost data will be sought: pre-development feasibility estimates, where available, and actual expenditure. Obtaining both sets of financial data will allow the exploration of shifts in planning requirements and development contribution levies between project inception, lodging of development applications, determination and approval; and the capacity to accurately estimate and cost planning requirements at project feasibility stage.

Qualitative information to assist in interpreting reasons for divergence between feasibility estimates and actuals will be sought during the interviews with developers and planners. Where possible, financial information will be provided and analysed ahead of the developer interviews.

This material is commercially sensitive and individually identifiable project information will not be made available for release.

Qualitative Research

The qualitative research will be conducted as part of the case study / field investigations. It is intended that the data will be gathered "one – on – one" with a number of property developers, since the quantitative data being collated is of significant commercial interest and therefore confidentiality will be a paramount consideration. The data gathering procedure will be by interview with the organisation's CEO and / or Financial Controller.

In accord with AHURI methodology for this type of project (Gurran et al., 2008), interviews with developers will provide an insight into their approaches to the planning process. These interviews will also be used to estimate the costs of building controls and regulations not covered in standard financial reporting (such as the cost impacts of set-backs or environmental considerations), and the costs associated with staff time and meetings with planning authorities. Where the financial records of the developer are incomplete or unclear, the interviews will provide a way of substituting costs, fees and charges. Developer interviews will also be used to confirm the financial data derived from the analysis of government documentation and developer financial records. This process will also assist in determining whether and how the cost impacts of specific planning requirements and charges have influenced decisions about the type or mix of housing being produced.

3.2 PARTICIPANTS

Participants in the study will consist of property development company representatives, at CEO or Financial Controller level, whom have been engaged in greenfield residential development projects. Because of sample size, it is intended that data derived from at least 5 (plus) projects will be collected from at least 10 organisations. The reason for this is to avoid difficulties in relation to sample sizes as previously outlined (Brooks & Tsolacos, 2010; Comrey & Lee, 1992); suggesting an indicative sample size of at least $n \geq 60$. Increasing the sample size (in order to improve the level of significance) will increase the ability of testing to discern effects, so therefore this will be a priority.

The basis for selection will be related to achieving the greatest possible geographical spread in the most recent period. A spread of project sizes (i.e.

allotment sizes) may also be an advantage. The following organisations have or are in the process of being contacted:

1. Pitman Property Group
2. Stockland
3. Property Council of Australia
4. LandMark White
5. JLL Jones Lang LaSalle
6. Brisbane Housing Company Ltd
7. UDIA
8. Urban Pacific Ltd
9. THG Resource Strategies
10. Knight Frank
11. Urbex
12. ULDA
13. Bovis lend Lease
14. Mirvac

The above organisations represent diversity in firms (small, medium and larger companies). This will assist in gaining an appreciation of the differences in relationships between developers, and the causes/impacts of costs associated with holding costs. For this reason, projects undertaken by developers who operate at the national level will be preferred, as will smaller firms who specialise in particular locations.

Where possible, the case study developments will be sought from different local government areas. An ideal scenario would be representations from cases located at inner city, middle ring, outer ring 'Greenfield' and non-metropolitan urban centres. In this way the cases represent a diversity of sites, enabling the testing for differences in Greenfield areas compared to infill or Brownfield sites.

The goal is to identify cases that might be regarded as more or less representative of the different development scenarios in the different regional areas

of each State jurisdiction. We will avoid cases situated on particularly difficult sites or associated with other particularly unusual contexts. To these ends, we have developed a matrix of potential development case study jurisdictions

3.3 INSTRUMENTS

The following table Table 3-2 describes instruments that will be used in the study for data collection:

Table 3-2 Instruments used in qualitative and quantitative analysis

Software support	Purpose / Type of Analysis	Instruments	Detail
NVivo 8	Qualitative Analysis	• Questionnaire and personal interview • Voice Recording (where possible)	Collation of case study discourses (outside of quantitative data)
SPSS Statistics 17	Quantitative Analysis	• Questionnaire • Personal interview to confirm financial details and clarify uncertainties.	Collation of case study quantitative data (financial records and financial commitments relating to greenfield property development projects) in preparation for data modelling (development of econometric model)
Microsoft Excel 2007 #	Quantitative Analysis	• Data primarily based on the above instruments	Development and refinement of economic model(s) used for determining the quantum of holding costs based on components over time
Lotus 1,2,3 v9.5 #	Quantitative Analysis	• Data primarily based on the above instruments	Development of theoretical economic model – plus as per Microsoft Excel 2007 above.

Microsoft Excel, and Lotus 1,2,3 will be used interchangeably depending on the nature of spreadsheet modelling required and the ability of the software to macro support the function required.

3.4 PROCEDURE AND TIMELINE

Figure 6-1 Research Output – Comparison of Research Output (Intended: Actual) provides an indication of where progress is at the current time (refer red marker denoted *"Progress line – May 2010"*), indicating that the research project has

commenced the Stage 5 case study (field) investigation phase. This is prior to the econometric modelling later on in Stage 4, since undertaking that task is dependent upon receiving data from the case study participants.

Detail concerning procedures for collecting and recording data is shown at Table 3-2 Instruments used in qualitative and quantitative analysis, above.

All instruments will be administered by the author, whom will conduct all interviews personally after making contact with the organisational representative. These processes will ensure the highest level of integrity, and are possible due to the relatively small expected sample size.

It is intended that questionnaires be developed immediately for distribution to case study participants, and then followed up by visitation "one-on-one". All data will be recorded onto hardcopy Microsoft Word format which will be imported as required (qualitative data imported to NVivo, and quantitative data imported to Lotus 1,2,3 or Microsoft Excel). Time frames, in accordance with the Project plan, for completion of each stage are as follows:

	Stage	**Date of completion**
1	Primary Literature Review and Desktop Study	Completed
2	Ongoing literature review	Ongoing
3	Preliminary Data Analysis & Interrogation	completed
4	Further evaluation and assessment / data modelling.	5 October 2010
5	Case Studies (Field Investigation)	7 September 2010 (conducted concurrently with Stage 4)
6	Final Report	16 November 2010

3.5 ANALYSIS

3.5.1 QUANTITATIVE ANALYSIS

Statistical data will be collated from case study participants and analysed utilising SPSS Statistics 17[10] software, in accordance with the methods and approach fully detailed at Section 3.1.2 Research Design (sub section "Quantitative Research"). Justification of the choice of statistics and the expected results that they will provide is also described in that section. The output from this will take the form of an econometric model, capable of resolving the research hypothesis.

Quantitative data collected from case study participants will also be used to verify and confirm the output from the preliminary economic model. This will be achieved by inserting the raw data into the variable assumptions contained within spreadsheet model, and examining the results by comparing them to the theoretical model outputs for the various base case and "what if?" scenarios.

3.5.2 QUALITATIVE ANALYSIS

Qualitative data will also be collated from case study participants and analysed utilising NVivo 8 software[11], in accordance with the methods and approach fully detailed Section 3.1.2 Research Design (sub section "Qualitative Research"). The discourse analysis will be derived from structured conversations that will follow up questionnaires previously submitted to participants. Together, this information will aggregated and thus captured ready for "coding" via the importing and transcribing facilities built into NVivo.

The qualitative data collected from case study participants is designed to:

1. ascertain their approaches to the planning process.
2. estimate the costs of building controls and regulations not covered in standard financial reporting

[10] The author undertook refresher training in SPSS Symposiums (Parts 1 to 4, including "Regression in SPSS") over a four week period in May 2009.

[11] The author completed training in QSR's NVivo in April 2009 (Certified completion for "NVivo 8 Fundamentals" and "Moving on in NVivo 8").

3. estimate the costs associated with staff time and meetings with planning authorities.
4. provide a way of substituting costs, fees and charges in the absence of incomplete or unclear financial records.
5. provide confirmation of the financial data derived from the analysis of government documentation and developer financial records.
6. assist in determining whether and how the cost impacts of specific planning requirements and charges have influenced decisions about the type or mix of housing being produced.

The above six information categories represent nodes that will act as themes or containers for the topic. These "tree nodes" will be coded by selecting text within conversations or notes that define it as belonging to that particular theme. In this way, ideas can be readily catalogued according to its topic. Aside from any additional "free nodes" that may have no clear logical connection with other nodes, these six themes will fit into a hierarchical structure (refer Figure 3-3 below). The hierarchical structure however is not static since NVivo is flexible in its ability to develop tree nodes when building models.

A seventh node relates to critical information to be extracted from participants. The qualitative data collected from case study participants will also assist in interpreting what constitutes the "generally held, widely perceived impact" of the effect of holding costs, in relation to housing affordability. This is required in order that the null hypothesis H_0 that "*holding cost influences over housing affordability is in accord with widely held perceptions"* can be properly tested. This is because the benchmark of "perceived impact" needs to be established.

NVivo is also able to provide visual representations of coding densities which will allow recurring themes to be easily recognised.

"Case" nodes can be used to categorise greenfield site details (e.g. size, location, etc.) - these will also be generated from details contained in the questionnaire. These could also be captured as other tree nodes; regardless, this will facilitate the identification of any data anomalies that hinder interpretation of qualitative or quantitative analysis. It will also enable categorisation of data where

sample sizes are large enough to warrant separation. Coding queries can be easily undertaken according to cases, even if the coding has been broadly undertaken.

"Relationship" nodes will facilitate connections between two nodes. The nature of the relationship will be defined at time of analysis.

Finally, the discourses will be analysed via a word frequency query that will identify the words most commonly used in interviews. The "tag cloud" summary provides a visual representation of up to 100 words alphabetically in varying font sizes (the most frequently occurring words appearing in larger fonts). This will assist in establishing recurring themes that occur across the breadth of case study participants.

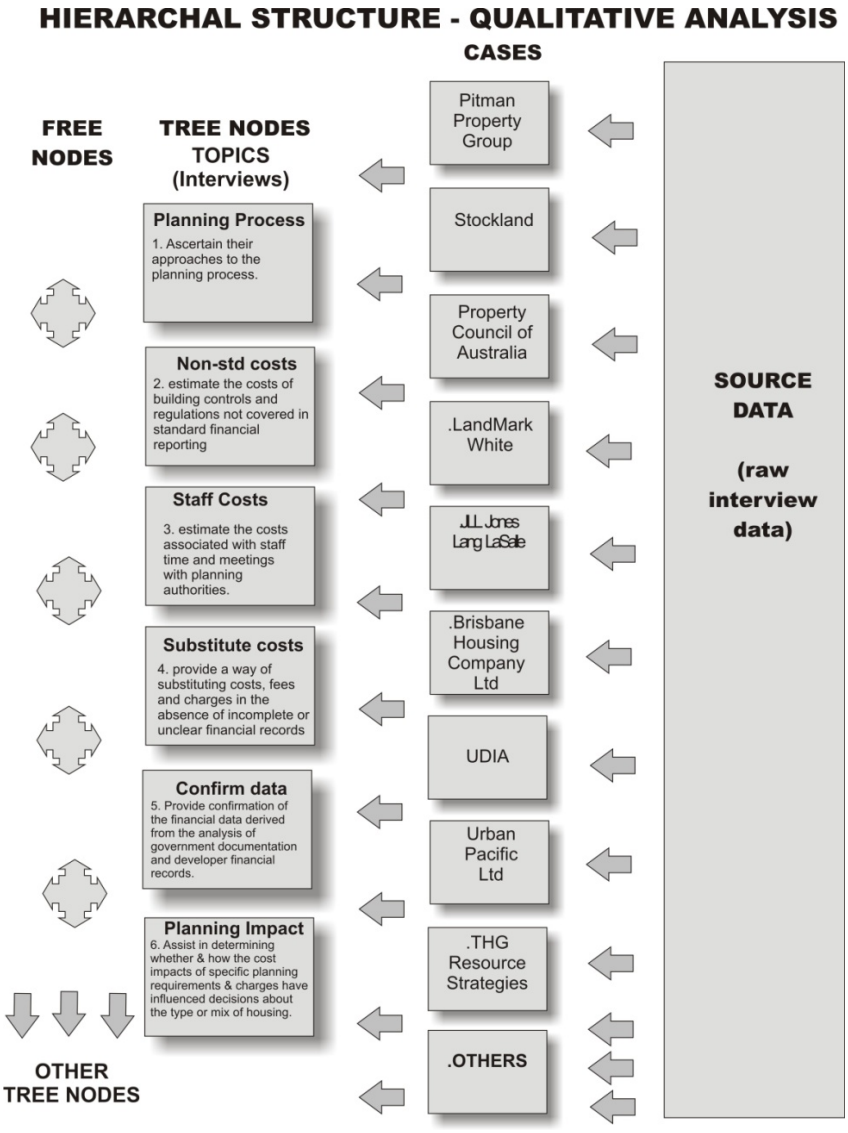


Figure 3-3 Hierarchal structure of qualitative analysis conducted through NVivo (diagrammatic representation only)

3.6 ETHICS AND LIMITATIONS

This research does not involve into humans, animals, genetically modified organisms or bio-safety material. Whilst the proposed research will not require any form of interaction with animals or humans that will necessitate a formal ethics clearance, the process will inherently involve the elicitation of knowledge from representatives of property development organisations at CEO, Financial Controller, or equivalent level. These interactions would take the form of interviews and may require the lodgement of an application for Low Risk Research Involving Human Participants. Such clearances will be procured as / if necessary.

Similarly, there may also be a need to obtain informed consent designed to meet QUT standards. This would incorporate details as to how potential participants will be identified, approached, recruited and screened, along with a copy of the questionnaire, interview questions and description of what participants will actually be asked to do.

Chapter 4: Progress to Date

This Chapter outlines the progress made to date by the author in researching the thesis topic. Section 4.1 Literature Review outlines the extent of the review of literature covered until the present time. Section 4.2 Research Methodology provides an indication of progress made with regards the research methodology adopted, and its ongoing suitability for implementation. Section 4.3 Economic Modelling provides details related to the data modelling conducted thus far, and the major outcomes. It has a focus on quantitative findings, defining the extent of holding cost impacts on housing affordability. The next Section 4.4 Research Output details the quantum of research output to the current time, and relates this to the research methodology and intended sequence of research outputs. Finally, Section 4.5 Next Steps details proposed research items (including refereed journal articles planned for publication in A or B ranked ERA rated journals), in accordance with the project plan.

4.1 LITERATURE REVIEW

It should be noted that the literature review is an ongoing process (refer Figure 3-1 Schematic diagram showing detail of research program highlighting methodology and sequence of research output) which will be continued throughout the breadth of this research program. Notwithstanding, an extensive literature review has already been conducted which has served to reveal the foundations for the research being undertaken. This has essentially concentrated itself in two main areas, namely housing affordability, and holding costs.

This review has seen the exposure of the dimensions and significance of housing affordability worldwide, but with a focus on the impacts being felt in Australia. Relationships between housing affordability and its various components, especially demand, and time, have been firmly established. The major researchers and their literature in the housing affordability agenda within Australia have been identified and considered (Berry, Mike, 2002a; Burke et al., 2007; Gabriel et al., 2005; Glaeser et al., 2008; Milligan, Vivienne et al., 2007; Randolph, 2007; Rowley & Costello, 2010; Small, 2009; Wood & Ong, 2009a, 2009b; Yates, 2007a, 2007b; Yates et al., 2007; Yates et al., 2006), along with coverage of the literature providing

detail as to the various ways housing affordability is measured. Correlative aspects related to housing costs, have also been established. Literature closely aligned with this research project (in particular Gurran et al., 2010; Gurran et al., 2008), have been identified and explored to ascertain there are no obvious overlaps in coverage.

In relation to holding costs, and in addition to definitional aspects, the literature review has established the evolution from the EOQ model. The review proceeds to investigate the make-up or componentry of holding costs, and the equations commonly used that underpin the calculation of holding costs. Extensive treatment is given with regards the relationship with opportunity costs, usage of appropriate discount rates, and other effects such as taxation, liquidity. The review also covers commentary on the way in which commercial software applications handle holding costs, with contrasts provided highlighting the inconsistencies of approach in holding cost calculations.

Both of these primary areas (i.e. housing affordability, and holding costs) have together prepared the way for the development of an economic model (covered in Section 4.3 Economic Modelling below), capable of calculating holding costs under a range of multivariate scenarios.

Another feature receiving attention is the theoretical aspects related to data modelling. In order to ensure a solid methodological approach, reference has been made to recognised authors in this field (notably Comrey & Lee, 1992; Dixit & Pindyck, 1994; Pindyck & Rubinfeld, 1987) as well as more contemporary authors (such as Brooks & Tsolacos, 2010; Studenmund, 2010).

4.2 RESEARCH METHODOLOGY

The research methodology adopted has provided a suitable mechanism for the investigation thus far, although at this stage the data analysis and interrogation has been somewhat preliminary in nature. Nevertheless, it has been possible to develop an economic model which has proved most enlightening especially with regards the sensitivity of major independent variables having a relationship with holding costs. It has also assisted in testing the hypothesis that holding costs have a more pervasive influence over housing affordability than is thought to be widely held.

The intended qualitative analysis is likely to complement the quantitative approaches adopted in the data modelling. It is intended to use this as a means to separate out perceptions from reality; particularly important in this instance given the apparent lack of consistency revealed by the literature with regards the theoretical aspects related to holding cost determination.

The case study investigations will serve to sustain and extend the economic modelling completed and proposed. It will provide the means to field test the economic model, and prepare the way for development of econometric approaches. Along the way, qualitative analysis will support the process, offering the opportunity to ascertain the understanding of major industry players involved in property development.

4.3 ECONOMIC MODELLING

4.3.1 CALCULATING HOLDING COSTS FOR INDIVIDUAL PROJECTS – COMPARISON WITH ESTIMATES DERIVED FOR THE QUEENSLAND HOUSING AFFORDABILITY STRATEGY

Holding costs in the case of new land or greenfield development potentially represents a significant cost that is considered by many commentators to be ultimately borne by consumers (end purchasers). The key questions here are:

- In the case of specific projects, what is a likely outcome in the particular instance? Is this likely to be of greater significance for a specific project area compared to others?
- Are there other costs associated with holding that potentially act to drive up prices, e.g. what is the impact of unnecessary delays in development assessment resulting in higher costs because of associated delays?

It is these questions that may have provided the foundation for the development of the Queensland Housing Affordability Strategy (QHAS), in particular the concept of bringing greenfield land into development ahead of time frames – a matter which is well entrenched within the QHAS philosophy. This strategy recognises that holding costs in the case of new land or greenfield development, potentially represents a significant cost that is ultimately borne by consumers (end purchasers). This approach of the QHAS, at least theoretically, is to counter this effect by

enabling land to be brought onto the market in the short to medium term, increasing market competition and choice (*South East Queensland Infrastructure Plan and Program 2009-2026*, 2009). Whilst an assessment of the provision of associated infrastructure and services is obviously also crucial, the speeding up of such processes are necessary if the issue of affordability is to be adequately addressed.

It is apparent that recognition of the holding cost burden underpins a desire to streamline panning and approval processes. This may be seen in policy decisions made subsequent to implementing the QHAS. For example, it has been reported (*Delivering the Queensland Housing Affordability Strategy - Greenfield land supply in South East Queensland*, 2008) that the state government has recently identified around 42 greenfield areas that could commence development in the short term, ranging in size from 100ha to 5,000ha . This is greenfield land in the Urban Footprint which is either 'committed' or 'potentially' available for development. It has been recognised that the efficient, timely and cost-effective delivery of infrastructure is critical to the development of greenfield areas.

The QHAS suggests that development holding costs during the assessment period can add between $15,000 - $20,000 per dwelling (*South East Queensland Infrastructure Plan and Program 2007-2026*, 2007) – as observed by Elliot previously. The QHAS recognises that this cost is passed on to the end purchaser, but can be significantly reduced by a more efficient planning and development assessment system. It is contended that not only do unnecessary delays in the development assessment process result in sometimes substantial delays in bringing land and housing to the market, but particularly in areas of high growth it can lead to higher development costs.

The importance of the calculation has been the subject of considerable political debate particularly during 2008. In 2009, other matters (world global financial crisis especially) have probably overshadowed the level of debate. Historically low interest rates may have also played their part in masking fundamental questions related to elements impacting housing affordability. In the case of Queensland, it has nevertheless been an integral part of the Housing Affordability Strategy, which is itself embedded with the South East Queensland Regional Plan. It is stated within the Plan that the strategy will ensure state land and housing is brought to market quickly and at the lowest cost (*South East Queensland Regional Plan 2009-2031* 2009). This

is to be achieved by *"reducing the timelines and associated holding costs of bringing new housing to the market"*. A more competitive and responsive land and housing market is the intention.

The QHAS is spearheaded by the Housing Affordability Fund which has been stated to provide an investment of $512 million over the next five years[12] to lower the cost of building new homes. In addition to the offset of infrastructure costs, the fund has been mooted to address "significant barriers to the supply of housing development" (Taylor, 2008) which includes holding costs – defined as being those costs incurred by developers as a result of long planning and approval waiting times. This announcement states that up to $30 million will be used to develop IT infrastructure and software to roll out nationally, electronic development assessment systems and online tracking services to reduce red tape and streamline planning approvals.

It has been observed (*National Housing Supply Council - State of Supply Report*, 2009) that the Australian Government's Housing Affordability Fund, a five-year, $512 million investment, will also address some areas that represent significant barriers to the supply of affordable housing, namely:

- the 'holding' costs incurred by developers as a result of long planning and approval times, such as interest paid to banks while awaiting development decisions by councils
- infrastructure costs, such as the laying of water pipes, sewerage, transport and the creation of parks.

Operating in tandem with the QHAS in Queensland has been the newly established Urban Land Development Authority (ULDA). Its mandate reflects QHAS philosophy, in particular that related to housing affordability, and specifically the speeding up of property development "red tape" processes. The ULDA has eight areas located within Queensland that they are / will be responsible for, and are

[12] The Fund has been announced by the Rudd Government as part of their total commitment to the Housing Affordability Fund which amounts to $512 million over a five year period, with $359 million allocated in the next four years.

concentrating on five of those areas which include Bowen Hills, Northshore Hamilton, Woolloongabba, Fitzgibbon and Mackay. Online information ("Urban Land Development Authority website," 2009) indicates that Bowen Hills, Northshore Hamilton and Fitzgibbon have been declared Urban Development Areas (UDA) with the ULDA is now responsible for assessing development applications in these areas. This is achieved by the UDLA assume the planning powers of local government and some state agencies – including assessing and deciding development applications within areas that have been declared Urban Development Areas (UDAs). In addition the ULDA will also develop key sites and priority infrastructure within UDAs, with the objective of working collaboratively with local government and developers to provide affordable housing on declared sites.

It is noteworthy that the ULDA intends to make housing more affordable by addressing factors that they perceive impacts on the price of new housing. This is stated ("Urban Land Development Authority website," 2009) to include *"getting land to market faster, streamlining development approvals, and simplifying planning requirements."* The primary way this is intended to be achieved is by speeding up the development assessment process. Although no acknowledgement is given on their website, the ULDA appears to directly quote information contained in the QHAS by stating that *"delays in the development assessment process can increase development holding costs between $15,000 to $20,000 per dwelling, which is typically passed on to the end purchaser"*. However, there is no indication of methodology used to derive this amount.

4.3.2 AN PRELIMINARY ECONOMIC MODEL EXAMINING THE EFFECTS OF TIME FOR A PROPERTY DEVELOPMENT PROJECT

The foregoing section provides a suitable background leading to the results achieved for the preliminary data modelling conducted thus far. It provides a benchmark by which results can be compared.

Base Case Scenario – Assumptions

The following provides a summary of an economic model to examine the effects of time, with a focus on holding costs – for a typical greenfield land development project in south-east Queensland.

Assumptions used to create the "base case scenario" are as follows:

- Interest rate (cost) - 9.00%
- Development Timing: (all post Identification of suitable site and site purchase)
- Assessment period: Planning & Building Consents including DA – 18 months
- Funds raising (debt and / or equity) 3 months
- Construction and development 9 months
- TOTAL development time from acquisition 30 months
- Undeveloped Land Cost - $37,500 per lot equivalent based on gross yield area
- Acquisition costs - 3% of acquisition and land costs per lot p.a.
- Development Costs, say $75,000 per lot
- Interest Costs on development - based on 30% of total development period = 9 months @ 9%
- Selling Costs @ 4.7% gross realisation
- Developers Margin - 20% of Total costs
- Gross realisation = $165,000 per lot.

The above assumptions are considered to be "typical" for a development in the project area concerned. It is considered to be representative of a realistic operating scenario, against which various "what-if" scenarios can be modelled.

Preliminary Modelling Results

The results of the alternate scenarios mentioned above, based on various time periods taken for assessment of planning and building consents (including DA), tend to exceed the QHAS estimations. They are summarised for a time period between 0 – 36 months in Table 4-1 below (the base line data for the whole "englobo" development is detailed at Table 6-2):

Table 4-1 Results: Holding costs over time (per lot basis - base case scenario)

Per Lot Basis	BASE CASE SCENARIO				
Assessment time (months) for Planning & Building Consents including DA	0	12	18	24	36
Undeveloped Land Cost	$37,500	$37,500	$37,500	$37,500	$37,500
Acquisition costs	$1,125	$1,125	$1,125	$1,125	$1,125
	$38,625	$38,625	$38,625	$38,625	$38,625
Loss of Interest over development period	$3,476	$7,265	$9,286	$11,395	$15,897
Rates, special council charges and land tax say	$1,364	$2,727	$3,409	$4,091	$5,455
Development Costs, say	$75,000	$75,000	$75,000	$75,000	$75,000
Interest Costs on development	$1,964	$3,980	$5,008	$6,049	$8,171
Total Development costs including interest	$81,804	$88,973	$92,703	$96,535	$104,523
Total Costs of Development including acquisition costs	$120,429	$127,598	$131,328	$135,160	$143,148
Developers Margin	$24,086	$25,520	$26,266	$27,032	$28,630
Sale price before selling costs	$144,515	$153,117	$157,593	$162,192	$171,778
Selling Costs	$6,792	$7,197	$7,407	$7,623	$8,074
Gross realisation	$151,307	$160,314	$165,000	$169,815	$179,851
TOTAL HOLDING COSTS FOR PROJECT	$5,441	$11,245	$14,294	$17,444	$24,069

The model demonstrates that in a typical or "base case" operating scenario, the total holding costs for a project equate to approximately $15,000 per lot, assuming it will take a total of 18 months for the assessment of planning and building consents (including DA). If this time is reduced by 6 months, the holding costs will reduce to just over $11,000 per lot, and if time is increased by 6 months, the holding costs will increase to $17,000 per lot. Put simply, for every month the assessment time is delayed, the end-user (whom ultimately incurs the holding costs) will pay extra $500 more. If any of the assumptions used, noted previously, vary, then there will be a commensurate or greater impact on the project. Suffice to say that those assumptions having the greatest impact include interest rates, and development timing (incorporating holding period). Initial acquisition cost and developers margin tend to be a functions related to gross realisation expectations.

If these timeframes are further extended, e.g. if the time taken for assessment exceeds 5 years, the model demonstrates that holding costs could climb to $40,000 per lot and beyond. This would effectively raise the average cost of each allotment from $165,000 (Base model assumption) to over $200,000 as follows:

Table 4-2 Economic Analysis to Examine the Sensitivity of Time on a Development Project – Gross realisation required to cover holding costs (per lot basis)

Economic Analysis to Examine the Sensitivity of Time on a Development Project

Time (Months) - Planning & Building Consents including DA	0	12	18 (Base Case)	24	36	48	60	68
Total Costs of Development including acquisition costs	$120,429	$127,598	$131,328	$135,160	$143,148	$151,597	$160,545	$166,807
Gross realisation required	$151,307	$160,314	$165,000	$169,815	$179,851	$190,467	$201,708	$209,576
TOTAL HOLDING COSTS FOR PROJECT	$5,441	$11,245	$14,294	$17,444	$24,069	$31,154	$38,738	$44,091

If the "base case" model of an 18 month assessment period (i.e. the time taken to obtain approval of planning consents including DA) is reasonably representative, it may be demonstrated that total holding costs for a project are almost $10,000 greater than if the time taken for assessment was zero. If the assessment period becomes extended for any reason, there is a commensurate impact on additional holding costs.

4.3.3 INCREASED COSTS AND HOUSING AFFORDABILITY – MEASUREMENT OF THE IMPACT UPON MORTGAGES

In terms of impact upon affordability, perhaps a useful way to examine this is to scrutinize not only the quantum of additional costs that extended assessment periods will cause, but perhaps more importantly, the impact upon the end-purchaser whom ultimately bears this cost, since a developer will inevitably pass these costs on to them.

Since new home buyers typically obtain finance to complete their purchase, for most purchasers this implies increased mortgage costs. Such consumers are therefore potentially pushed into the realms of un-affordability. Therefore, measuring this impact can be achieved by calculating the additional monthly mortgage repayment required to cover the costs of extended assessment, and also the total costs of these

mortgage repayments over the life of a "typical" loan period. The impact of these costs can then be examined in terms of average household income. In this way, the impact of assessment time can be directly related to housing affordability since it is looked at in the context of the "30/40 affordability rule".

The outcome of this model and the measureable impacts on affordability clearly demonstrate that the assessment period is a very sensitive factor affecting housing affordability.

4.3.4 DISCUSSION OF RESULTS

At this time only some of the various elements of holding cost have been examined. The measurement of opportunity cost provides a preliminary assessment of the possible linkages with regulatory assessment periods and their impact. It is recognised that ambiguities potentially emerge where a distinction between the strength, as against quantum, of regulation, occurs: there can be opposing effects.

The results of this model, and the resultant impacts on affordability are summarised at Table 4-3. The model developed assumes a base case scenario of 18 months assessment time (planning and building consents, including Development Approval DA) resulting in a total holding cost for a typical 200 lot project in south-east Queensland of approximately $14,300 per lot. This calculates out at a gross realisation of $165,000 based on a 20% developer's margin. It assumes a prevailing interest charge of 9% effective annual rate, and a timeframe of 3 months for debt / equity raising by the developer, and 9 months construction and development period.

Other assumptions have been made concerning undeveloped land cost, various acquisition costs, rates, special council charges and land tax, development costs and selling costs (however, it should be noted that the model demonstrates relatively weak sensitivity to changes in these assumptions, excepting development costs which are calculated at $75,000 per lot for the purpose of creating a base case scenario).

Table 4-3 Economic analysis examining the sensitivity of time on a property Development Project, incorporating impact on mortgage repayments

Economic Analysis to Examine the Sensitivity of Time on a Development Project

Per Lot	BASE CASE SCENARIO						
TIME (months) Planning & Building Consents including DA	18	0	12	24	36	48	60
TOTAL HOLDING COSTS FOR PROJECT	**$14,294**	**$5,441**	**$11,245**	**$17,444**	**$24,069**	**$31,154**	**$38,738**
Total costs of mortgage repayments due to holding costs, per month	$130	$50	$103	$159	$220	$284	$354
Loss of interest due to assessment period	$5,330	$0	$3,476	$7,265	$11,395	$15,897	$20,804
Total costs of mortgage repayments due to assessment period, per month	$49	$0	$32	$66	$104	$145	$190
Cost of mortgage repayment as a result of assessment period as a % of average household income	1.67%	0.00%	1.09%	2.27%	3.57%	4.98%	6.51%

As Figure 4-1 demonstrates, holding costs rapidly rise from the aforementioned $14,300 to $24,000 for a 36 month assessment period, or just under $40,000 per allotment for a 60 month assessment period:

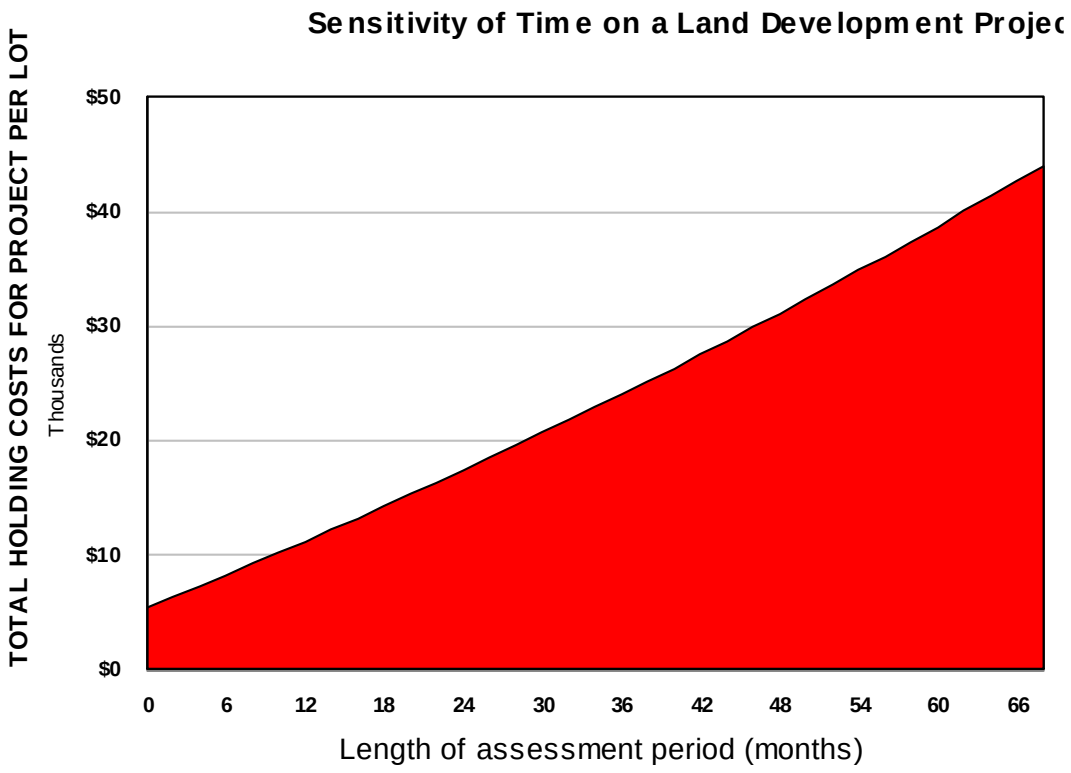


Figure 4-1 Sensitivity of Time

These costs can be converted to additional mortgage repayment equivalent required to cover these additional costs, as shown in Figure 4-2 below:

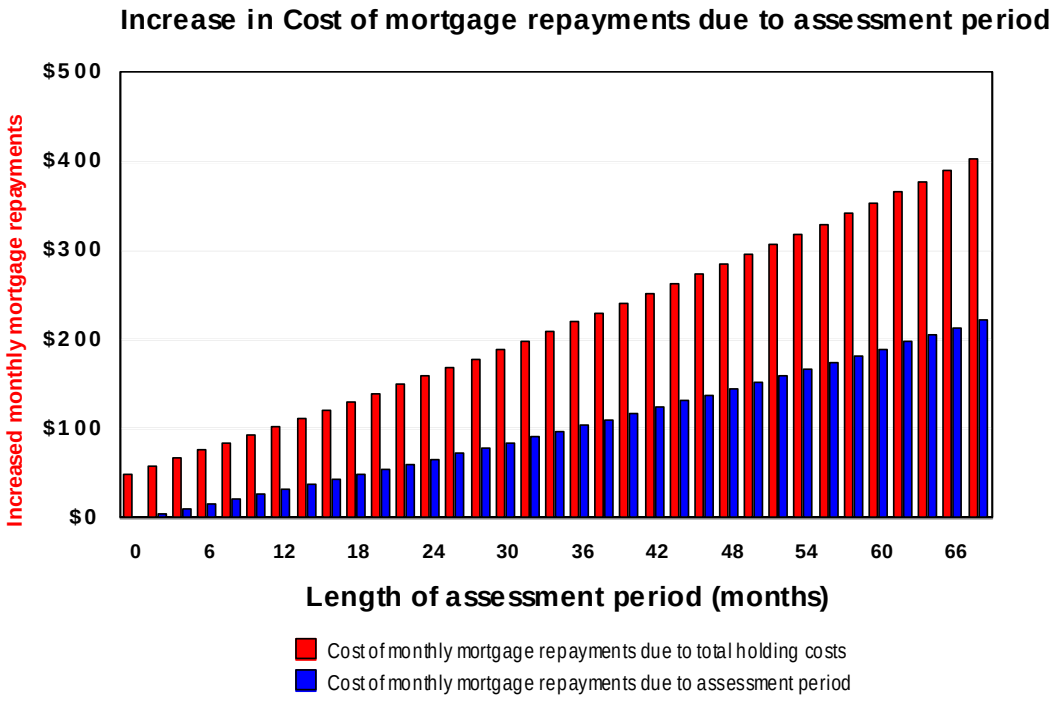


Figure 4-2 Cost of Mortgage Repayments Due to Holding Costs

For our 18 month base case scenario this is equivalent to $130 per month for all holding costs, or $49 per month to cover the costs of the assessment period alone. If the assessment time is extended to say 36 months it will add $89 per month additional mortgage repayment due to the extended assessment period (total holding costs actually add a total of $220 per month in mortgage repayments), equating to $21,416 over the life of a typical loan period of 20 years. If the assessment time extends to 60 months, the cost of mortgage repayments rises to $354 per month due to total holding costs ($190 per month for costs associated with the assessment period only).

Finally we can examine the above results in the light of additional costs of mortgage repayment (as a result of extended assessment period) as a percentage of average household income. In this instance the amount for our base case scenario (18 months assessment period) would be 1.67%. The overall cost of mortgage repayment required to cover an assessment period of 36 months is 3.57% of average household

income, rising to 6.51% for a 60 month assessment period. The impact of even lengthier assessment periods accelerates as time proceeds as demonstrated s:

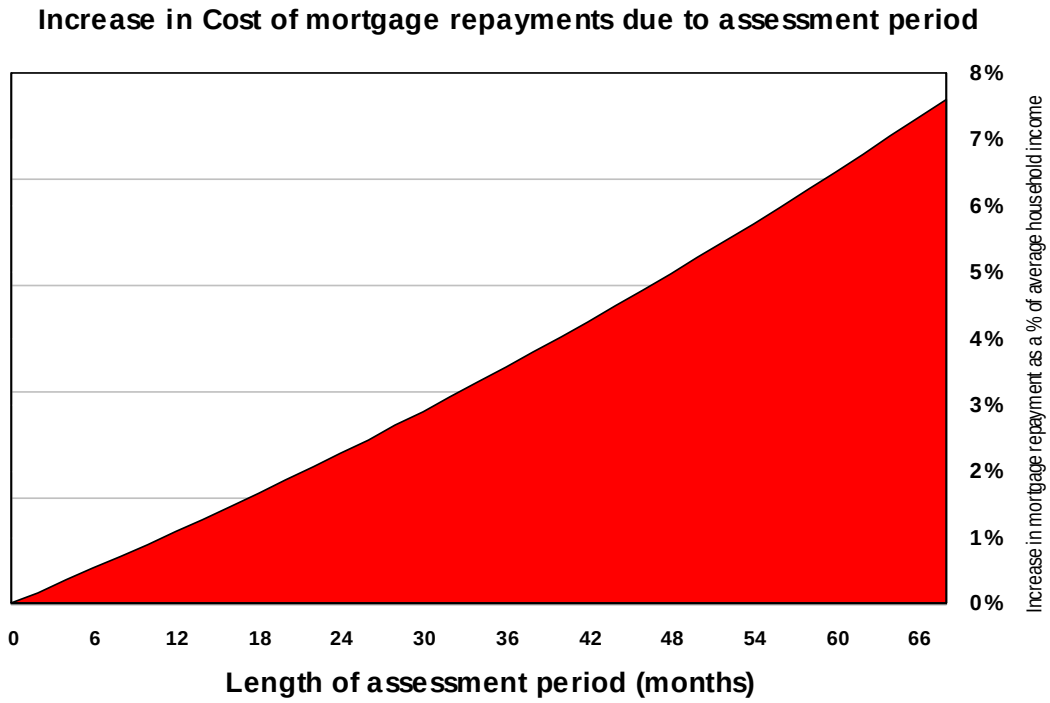


Figure 4-3 Increase in Cost of Mortgage as a % of Household Income

Table 4-3 summarises results obtained for selected time periods. However, It should be noted that the cost percentages of average household income would be even higher for those in the bottom 40% of household income distribution - in concert with the "30/40 affordability rule".

It may therefore be concluded that even small shifts in assessment period can significantly affect housing affordability. It emphasises the need for timely processing by regulatory authorities, advocating a streamlining of those processes likely to simply add a quantum of time without any strengthening of positive outcomes.

This preliminary research will be further developed with additional market and non-market variables examined. Their impact on housing affordability could then be assessed in the context of analysing the impact of holding costs in greater detail. Further analysis is also ideally required across multiple regional areas, cross-referencing with a rigorous international comparison study conducted over time.

Interest Rate Impact

The modelling indicates significant sensitivity to the rate of interest and its impact over time. This is logical since it is interest rate equivalent that underpins the holding cost calculation.

This is demonstrated by comparison of our base case scenario which is predicated on the basis of an interest rate of 9% effective per annum. Based on a 5 year assessment period, should this rate increase to 12% then the holding cost charge rises from $354 per month monthly mortgage equivalent (representing 6.5% of household income), to $432 per month which is slightly under 8% of household income. The curve is logarithmic since the impact becomes more pronounced as the interest rate increases. For example, at an extreme of 20% interest charge, the holding cost charge rises to $663 per month monthly mortgage equivalent or 12.2% of household income.

This effect may be seen with reference to Figure 4-4 and Figure 4-5 below:

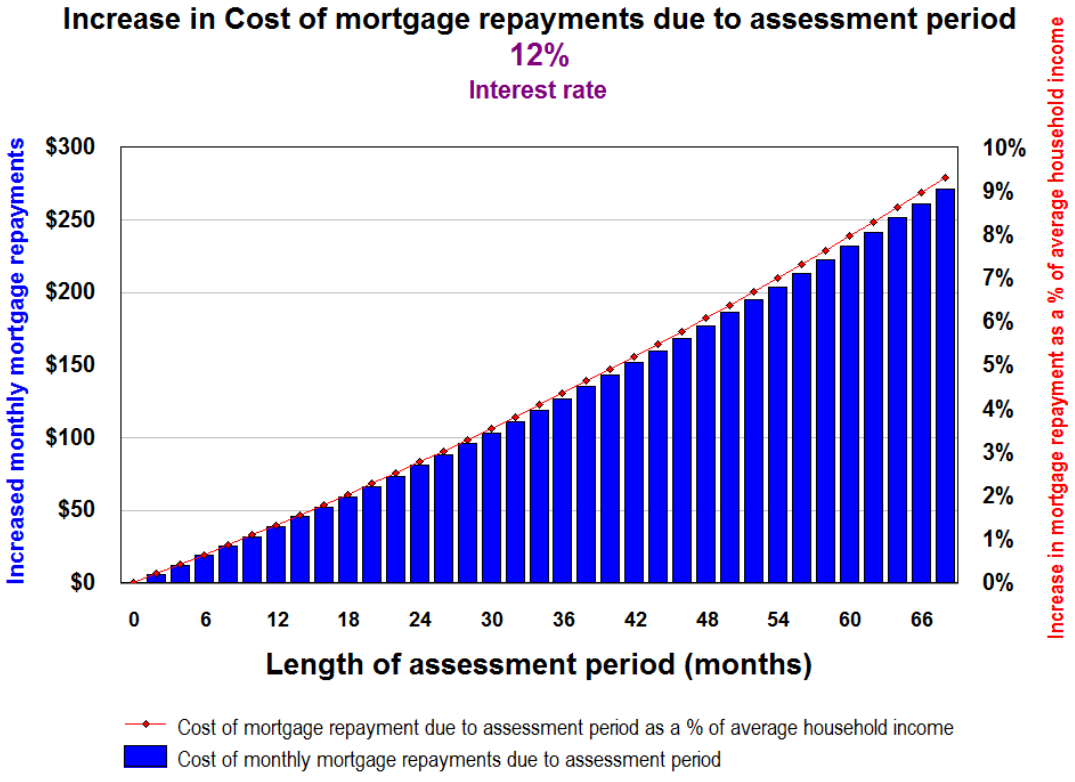


Figure 4-4 Increase in cost of mortgage repayments and impact on housing affordability: Interest rate effect @ 12% p.a.

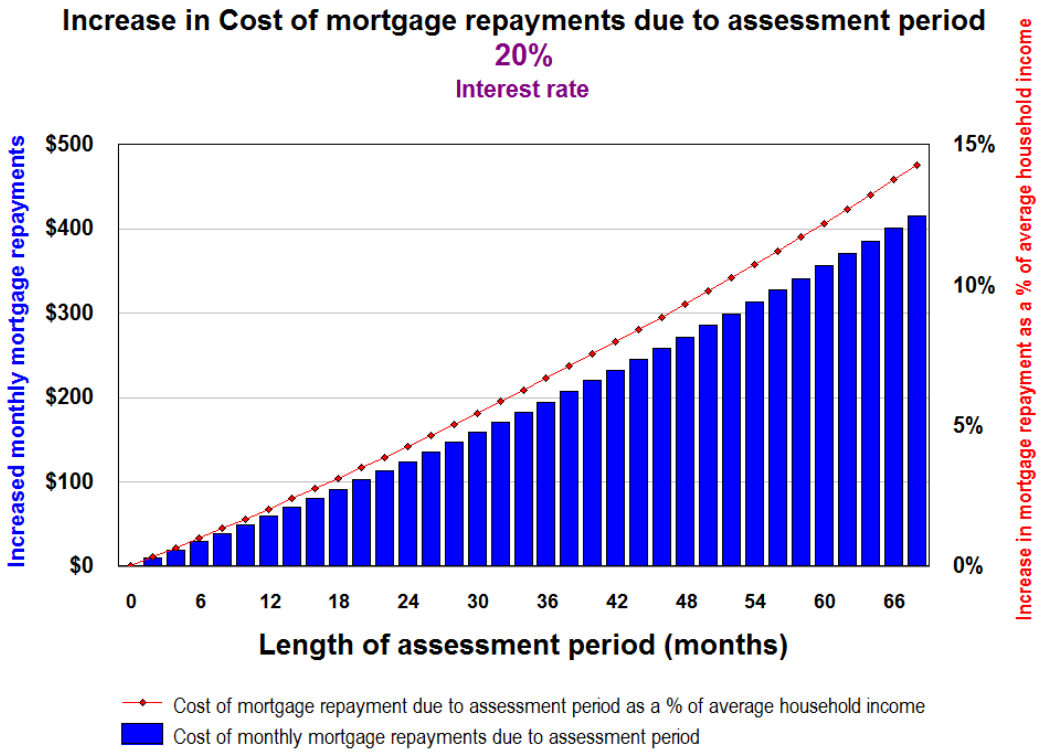


Figure 4-5 Increase in cost of mortgage repayments and impact on housing affordability: Interest rate effect @ 20% p.a.

The effect of such a large interest rate variation is significant even at more modest levels of assessment periods. For example, even at the level of our base case scenario (18 months) the cost of mortgage repayment as a result of assessment period as a percentage of average household income rises from 1.67% through 2.74% to 7.13% at interest rate levels increasing 9% through 12%, to 20% per annum.

This reinforces conclusions that even small shifts in interest rates can significantly affect housing affordability especially for new home buyers – not only because it represents an obvious increase in mortgage repayments more generally - but because of holding cost impact and the subsequent increase in mortgage repayments required to cover that additional cost. It demonstrates the inherent risk (especially for low income households) of entering variable rate transactions in low interest rate environments. The buyer is even further exposed to the potential for housing stress where income levels are static or falling since this becomes unbalanced in the event of even small "corrections" occurring with prevailing market rates.

4.4 RESEARCH OUTPUT

Appendix A: Publications Output to date, provides details relating to research output. Although the intention was to have a research output of between 3 and 4 items completed by the current time, as detailed on the table a total of ten research items have been output by the author in relation to this study, including three refereed journal articles (two of which are pending acceptance ranked A and B on the ERA ratings[13], and one accepted ranked B), six conference items (including four refereed papers, two rated A on the ERA rankings, one rated B, and one not ranked), and one unpublished report. All these documents have been lodged on QUT e-Prints, located at http://eprints.qut.edu.au/view/person/Garner,_Gary.html.

Appendix B: Research Output Progress, compares the actual research output to the intended sequence contained in the research methodology. This enables a comparison of the intended research output milestones, and results actually achieved.

4.5 NEXT STEPS

It is intended that this research project proceed in accordance with the activities and time frames detailed in the Chapter 5: Timeframe for Completion of Program, and outlined at Appendix D (Research Timelines).

The next step involved in this project is the field (case study) investigation, designed to, inter alia, provide the means for testing the economic model already developed. It will also assist in the further evaluation and advanced data modelling. This will lead to the development of an econometric model.

With regards research output, there are three journal articles planned for publication in A or B ranked ERA rated journals in accordance with the project plan shown at Appendix D (Research Timelines), and also detailed at Appendix A (Publications Output). These first two papers are linked with completion of the Case Studies (Field Investigations) and the further evaluation and assessment (data

[13] ERA refers to the newly developed Australian Government research quality and evaluation system, Excellence in Research for Australia (ERA) initiative.

modelling) phases; and the last being written upon completion of the thesis final report.

Chapter 5: Timeframe for Completion of Program

As detailed at Appendix D (Research Timeframes), it is planned to lodge thesis for examination prior to the end of this year, 2010. Major activities and their related timeframes for completion are detailed as follows (milestones to date since course entry are also incorporated):

Figure 5-1 Major planned activities and time frames for completion

Task	Duration (working days)	Start	Finish
Enrol in Masters of Applied Science (Research) Program	**0d**	**17/07/06**	**17/07/06**
IFN001 - Advanced Information Retrieval Skills Coursework	**97d**	**19/07/06**	**30/11/06**
Enrol in IFN001 and commence study	0d	19/07/06	19/07/06
Undertake IFN001 AIRS - Modules 1 - 4	97d	19/07/06	30/11/06
Stage 2 Proposal (preliminary)	**837d**	**17/07/06**	**30/09/09**
Prepare (revise) Introduction / Abstract	10d	17/07/06	28/07/06
Prepare program of research and investigation	45d	17/07/06	15/09/06
Design proposed research	90d	18/09/06	19/01/07
Develop (revise) timelines for significant milestones	5d	22/01/07	26/01/07
Conduct preliminary literature review	40d	18/09/06	10/11/06
Complete AIRS (IFN001)	0d	30/11/06	30/11/06
Prepare and provide Annual Report	0d	28/09/07	28/09/07
Revise Stage 2 Proposal and develop / fine tune project / develop research question	495d	29/01/07	19/12/08
Prepare and provide Annual Report 2008	0d	1/10/08	1/10/08
Prepare and Provide Annual Report 2009	0d	30/09/09	30/09/09
Topic Change	**321d**	**1/10/08**	**23/12/09**
Change Topic as a result of Stage 2 investigation and other factors	270d	1/10/08	13/10/09
Submission of Topic change to Supervisors	41d	14/10/09	9/12/09
Topic Change approved	0d	9/12/09	9/12/09
Prepare revised program of research and investigation including design	10d	10/12/09	23/12/09
Stage 2 Proposal (Revised)	**10d**	**23/12/09**	**6/01/10**
Submission of Stage 2 Proposal	0d	23/12/09	23/12/09
Stage 2 Proposal considered	10d	24/12/09	6/01/10
Stage 2 approved	0d	6/01/10	6/01/10

Task	Duration (working days)	Start	Finish
Conferences & Publications	**565d**	**17/09/08**	**16/11/10**
Conference Paper #1 (refereed) Planning Institute of Australia	0d	17/09/08	17/09/08
Conference Paper #2 (refereed) International Cities Town centres & Communities Society	0d	7/10/08	7/10/08
Conference Item (refereed) Brisbane	0d	12/11/08	12/11/08
Journal Article #1 (refereed) Queensland Planner	0d	16/04/09	16/04/09
Conference Paper #3 (refereed) CRIICOM Nanjing	0d	29/10/09	29/10/09
Conference Paper #4 (refereed) PRRES N.Z.	0d	25/01/10	25/01/10
"Conference Item (refereed) SEQ Property Colloquium, Brisbane"	0d	4/03/10	4/03/10
Report (unpublished) - Holding & Opportunity cost theory	0d	3/05/10	3/05/10
"Journal Article #2 (refereed) Urban Economics (submitted, pending)"	0d	31/05/10	31/05/10
"Journal Article #3 (refereed) Journal of Urban Planning & Development (submitted, pending)"	0d	31/05/10	31/05/10
Journal Article #4 (refereed) Journal of Housing Economics (planned)	0d	7/09/10	7/09/10
Journal Article #5 (refereed) Journal of Property Research (planned)	0d	5/10/10	5/10/10
Journal Article #6 (refereed) Journal - Real Estate Economics (planned)	0d	16/11/10	16/11/10
Confirmation of Candidature	**109d**	**7/01/10**	**8/06/10**
Prepare Confirmation Report (articulation to PhD) and fine tune thesis objectives	109d	7/01/10	8/06/10
Confirmation Seminar held	0d	8/06/10	8/06/10
Project Proceeds from Confirmation	**120d**	**9/06/10**	**23/11/10**
Ongoing literature review	120d	9/06/10	23/11/10
FIELDWORK - case Study data collection / Field Investigation	65d	9/06/10	7/09/10
Conduct preliminary analysis	20d	8/09/10	5/10/10
Conduct statistical analysis of results obtained (MVRA)	10d	8/09/10	21/09/10
Prepare findings and incorporate any other evidentiary links	30d	6/10/10	16/11/10
Final draft report completed	0d	16/11/10	16/11/10
Lodgement of thesis for examination	0d	16/11/10	16/11/10
Final Seminar	**20d**	**17/11/10**	**14/12/10**
Revise report as required	20d	17/11/10	14/12/10
Final Seminar held	**0d**	**14/12/10**	**14/12/10**

Major planned milestones are summarised as follows:

Table 5-1 Major planned milestones

Milestone	*Time-frame*
Commencement of fieldwork	immediate
Completion of fieldwork	Early September 2010
Statistical analysis completion	Late September 2010
Final draft report completed	Mid-November 2010
Final Seminar	By year end (2010)

Chapter 6: Conclusions

This Chapter presents concluding comments outlining the preliminary findings of the research, having undertaken literature review, developed the research design, and made progress with economic modelling as a forerunner to case study (field investigations), and further evaluation, assessment, and data modelling.

Section 6.1 Preliminary Conclusions and Implications, contains preliminary conclusions emanating from the theory originally proposed and tested by theoretical modelling, and looks towards the practical implications of the research. It also provides further definitive commentary (within the bounds of generalisability) on the hypothesis / research questions. Section 6.2 Limitations of the research, confirms expected research limitations, and also describes any practical or other limitations of the research that may not have been originally envisaged. The final section 6.3 Recommendations, provides a discussion of where the study may be extended, suggesting the raising of new and pertinent questions for future research.

6.1 PRELIMINARY CONCLUSIONS AND IMPLICATIONS

The focus of this research is to examine holding cost theory based on the proposition that it is a primary driver of housing affordability. Although widely recognised as being significant, it tests the hypothesis that the impacts of holding costs are more pervasive than generally acknowledged. Connections between holding costs and housing affordability are central themes explored throughout. The dimensions of regulatory assessment as part of the "development pipeline" are also given some attention, in order to establish the extent of diversity that exists between different regulatory regimes. The outcomes of this are compared against attempts to quantify holding cost impacts as reviewed in the literature.

This research confirms the complexity of housing affordability in association with holding costs. In acknowledging the many faceted and multi-dimensional topic of housing affordability, it recognises that holding costs – whilst only one contributor - is nevertheless clearly significant.

The literature review provides an appropriate background to modelling of holding cost elements via spreadsheet scenario analysis. In particular, there has been a focus of assessment periods since it demonstrated itself to be such a significant driver in the overall holding cost calculation. Testing the impact of the major drivers of holding costs seeks to clarify the impacts on housing affordability. The primary assumed independent variables, including interest rates (in particular), and the passage of time, can be s examined and a comparison of outcomes made.

In examining theoretical various models utilised for both defining and measuring holding costs, it has been demonstrated that most ultimately rely upon derivations of the Present Value / discounting approach. However, the application of these "first principles" in PV varies widely. As a result, the methodology used in calculating holding costs also has wide variation. On many occasions, the methodology utilised is not obvious, or even disclosed. This makes it difficult to ascertain the detail of major assumptive variables (even interest rate(s) and timing). This therefore compromises the integrity of outcomes. The extent of rigor in data modelling is not apparent. Whilst acknowledging that the effects of liquidity, interest / discount rate selection, and imprecise timelines add considerable complexity to the equation, many commentators provide vague, limited, or even no detail when applying holding cost theory to generic or specific land development projects.

Despite this lack of detail, it has been determined that significant resources have been poured into policies designed to inhibit the holding cost effect in Australia, although much of this has been confined to the containment of holding costs related to timelines involved in regulatory assessment and planning. A preliminary assessment of the linkages of holding costs with regulatory assessment periods evidence often opposing effects. This relates to ambiguities connected with endeavouring to distinguish differences between the strength, as against quantum, of regulation.

Nonetheless, the consequences of extended assessment periods as a component of holding costs is becoming more apparent as a fundamental driver impacting on the quantum of holding costs – and therefore housing affordability. A few key recent studies have observed that little attempt has been made to quantify the direct costs to housing development arising from government taxes and planning regulations – certainly with any degree of academic rigour. Yet it is emerging, as a result of

research undertaken in this study, that it is these costs which may have some of the greatest impacts on housing affordability.

It was this very problem, amongst others, that Gurran sought to overcome in a major study looking into "Planning, government charges, and the costs of land and housing" (Gurran et al., 2008). At the time of commencing this dissertation, that AHURI Project was identified by the author as being closely aligned. However, ultimately the nature and extent of holding costs was inconclusive as detailed in the recently released final report "Counting the costs: planning requirements, infrastructure contributions, and residential development in Australia" (Gurran et al., 2009) despite further analysis arising out of the research in the arising paper "How do planning requirements impact housing costs and the development process?" (Gurran et al., 2010). The original study proposed to develop a fee schedule outlining the common planning procedural and design requirements, as well as direct fees, charges and development contributions in each State and local government area. The fee schedule was to include a capacity to record non planning related fees or charges as nominated by developers during the case study interviews, as well as estimated or total development costs with provision to detail both *time* and *holding cost* (Gurran et al., 2008, pp. 66-67). Regrettably, the researchers, in their final report, declared that the analysis was limited by a lack of financial data provided by the sample of case study developers. Nevertheless, qualitative data ascertained that the most significant costs perceived by respondents related not to quantifiable fees and charges, or development standards, but to more amorphous issues associated with procedural costs and land prices. Uncertainty about timeframes and likely planning requirements were rated as significant, unquantifiable and unpredictable problems, leading to a range of other negative outcomes – such as missed market opportunities. (Gurran et al., 2009, p. 14). This therefore confirms that despite a lack of quantifiable data, the impact of time-frames, and therefore holding costs, was a major factor considered by developers themselves.

Ultimately, one of the primary outcomes of this research is to identify which (if any) part of the holding cost matrix links to public or private planning or statutory instrument or instruments best capable of supporting, or alternatively negatively impacting, affordable housing concepts. Although the extent to which the assessment period as a contributor impacting housing affordability has yet to be fully

established, the policy implications for this research influence changes to the framework used in Australian jurisdictions. These changes potentially have a profound effect on the promotion or retention of affordable housing. Therefore, quantification of the impacts of holding costs, focussed on the timing of assessment periods has particular relevance. Its identification potentially maximises the opportunities for delivering affordable housing in Australia.

The modelling conducted to date has incorporated various elements of holding costs, and whilst the output has yet to be "field tested" it demonstrates the profound impact upon housing affordability. It can be concluded that even quite small shifts in holding cost components, especially interest rates or assessment periods, can significantly affect housing affordability. For example, even a typical scenario for a 200 lot subdivision in a 9% interest rate environment, and a conservative 18 month regulatory assessment timeframe results in a total holding cost of approximately $14,300 per lot. However, holding costs rapidly rise from the aforementioned $14,300 to $24,000 for a 36 month assessment period, or just under $40,000 per allotment for a 60 month assessment period.

In order to assess the impact on housing affordability, these costs can be converted to additional mortgage repayment equivalent required to cover these additional costs. The additional costs of holding can be expressed in terms of additional mortgage repayment required to cover those costs. This amount can be further converted into a proportionate amount of average household income. In this way, calculated amounts can be applied against the "30/40 affordability rule" or other commonly used measures that identify impact against housing affordability.

Reverting to our 18 month base case scenario, this can be expressed as being equivalent to $130 additional costs per month for all holding costs, or $49 per month to cover the costs of the assessment period alone. If the assessment time is extended to say 36 months it will add $89 per month additional mortgage repayment due to the extended assessment period (total holding costs actually add a total of $220 per month in mortgage repayments). If the assessment time extends to 60 months, the cost of mortgage repayments rises to $354 per month due to total holding costs ($190 per month for costs associated with the assessment period only). It is worth noting that the development pipeline period can extend well beyond this period.

Expressed as a percentage of average household income, the amount for our base case scenario (18 months assessment period) would be 1.67%. The overall cost of mortgage repayment required to cover an assessment period of 36 months is 3.57% of average household income, rising to 6.51% for a 60 month assessment period. The impact of even lengthier assessment periods accelerates as time proceeds. In addition, the cost percentages of average household income would be even higher for those in the bottom 40% of household income distribution - in concert with the "30/40 affordability rule".

The modelling also indicates significant sensitivity to the rate of interest and its impact over time – a logical outcome since it is interest rate equivalent that underpins the holding cost calculation. For example, our base case scenario is predicated on the basis of an interest rate of 9% effective per annum. Based on a 5 year assessment period, should this rate increase to 12% p.a effective, then the holding cost charge rises from $354 per month monthly mortgage equivalent (representing 6.5% of household income), to $432 per month which is slightly under 8% of household income. This effect accelerates as the interest rate increases. For example, at an extreme of 20% interest charge, the holding cost charge rises to $663 per month monthly mortgage equivalent, or 12.2% of household income.

Therefore, shifts in interest rates can significantly affect housing affordability especially for new home buyers not only because of the impact of mortgage increases, but also holding cost impacts. The potential for mortgage stress increases not only when income levels are falling, but also when they are stable since the equation becomes unbalanced in the event of even small "corrections" occurring with prevailing market rates.

6.2 LIMITATIONS OF THE RESEARCH

This research is indicative of the potential impact holding costs have on housing affordability. In order to fully understand the drivers, additional research into its underlying nature and effects, and in particular, an analysis over time, is indicated.

The economic model developed demonstrates the potential impacts of holding costs on housing affordability over time, however at this point there has been no

attempt to take it to the level of an econometric model that demonstrates the likely predictors of housing affordability especially those focussed on the impact of planning delays due to extended regulatory assessment periods. The need for additional consideration of further market and non-market variables, and their likely impact on housing affordability, is also apparent. This will assist in determining the total impact of holding costs.

The need for a broadly based case study analysis (ideally by regions and towns in Australia), i.e. empirical case study analysis, preferably cross-referencing with a rigorous international comparison study, is indicated. Since the issue of housing affordability itself has a space and time variance, such analysis needs to be conducted over time.

6.3 RECOMMENDATIONS

Recommendations in proceeding with this research are summarised as follows:

1. Conduct additional statistical analysis capable of presenting predictive models that reliably quantify the impact of planning delays, and other holding cost variables, based on various group relationship data. (Subject to field testing, it may be anticipated that such models could be readily developed as a result of this initial research)
2. The considerable variation between various planning instruments (geographically), and the length of regulatory assessment periods, implies the need to collect empirical evidence based on various group relationship data – i.e. a case study approach. Further analysis across multiple regional areas may also reveal if there are any patterns emerging.
3. The above process will facilitate field testing of theoretical economic model already developed, and predictive econometric models not yet developed, that have potential to reliably quantify the impact of planning delays, and other holding cost variables.

Appendices

APPENDIX A: PUBLICATIONS OUTPUT TO DATE

Table 6-1 Publications Output

	Item Type	Item	date
1.	Conference Paper - ERA A (refereed)	Garner, Gary O. (2008) *The impact of planning delays and other holding costs on housing affordability.* In: Planning Institute of Australia, Queensland State Conference : Looking Forward Outback, 17-19 September 2008, Longreach, Queensland.	17-19 September 2008
2.	Conference Paper - ERA not ranked (refereed)	Garner, Gary O. (2008) *Preliminary findings related to the conceptualisation, sensitivity and measurement of holding costs and impact on housing affordability.* In: International Cities Town Centres & Communities Society 2008 Conference, 7–10 October 2008, Sydney Olympic Park, Sydney.	7–10 October 2008
3.	Conference Item - ERA not ranked	Garner, Gary O. and Han, Hoon (2008) *Housing affordability.* In: Housing Affordability - Presentation to THG Personnel, 12 November 2008, Brisbane, Australia. (Unpublished)	12 November 2008
4.	Journal Article - ERA B (refereed)	Garner, Gary O. (2008) *The impact of planning delays and other holding costs on housing affordability.* Queensland Planner, 48(4). pp. 21-27.	16 Apr 2009
5.	Conference Paper - ERA B (refereed)	Garner, Gary O. (2009) *Selected elements of housing affordability impacting otherwise potentially sustainable communities.* In: Proceedings of the 14th International Research Symposium on Advancement of Construction Management and Real Estate, 29-31 October 2009, Nanjing. (In Press)	29-31 October 2009
6.	Conference Paper - ERA A (refereed)	Garner, Gary O. (2010) *Approaches for calculation of holding costs in the context of greenfield residential development.* In: Proceedings of the 16th Pacific Rim Real Estate Society Conference, 24-27 January 2010, Wellington, New Zealand.	24-27 January 2010
7.	Conference Item – ERA not ranked	Garner, Gary O. (2010) *Holding cost model for Greenfield Housing developments.* In: South East Queensland Property PhD Colloquium, 4 March 2010, Queensland University of Technology, Brisbane, Queensland.	4 March 2010

	Item Type	Item	date
8.	Report (unpublished)	Garner, Gary O. (2010) *Holding and opportunity cost theory in a property development context.* [Working Paper] (Unpublished)	1 May 2010
9.	Journal Article - ERA A (refereed)	Garner, Gary O. (2010) *Calculating Holding Costs for Greenfield Residential Development.* Journal of Urban Economics.	pending
10.	Journal Article - ERA B (refereed)	Garner, Gary O. (2010) *Holding Cost Modelling for Residential Property Developments.* Journal of Urban Planning and Development	pending
11.	Journal Article - ERA B (refereed)	Journal of Housing Economics	Planned
12.	Journal Article - ERA B (refereed)	Journal of Property Research	Planned
13.	Journal Article - ERA A (refereed)	Real estate economics	Planned

APPENDIX B: RESEARCH OUTPUT PROGRESS

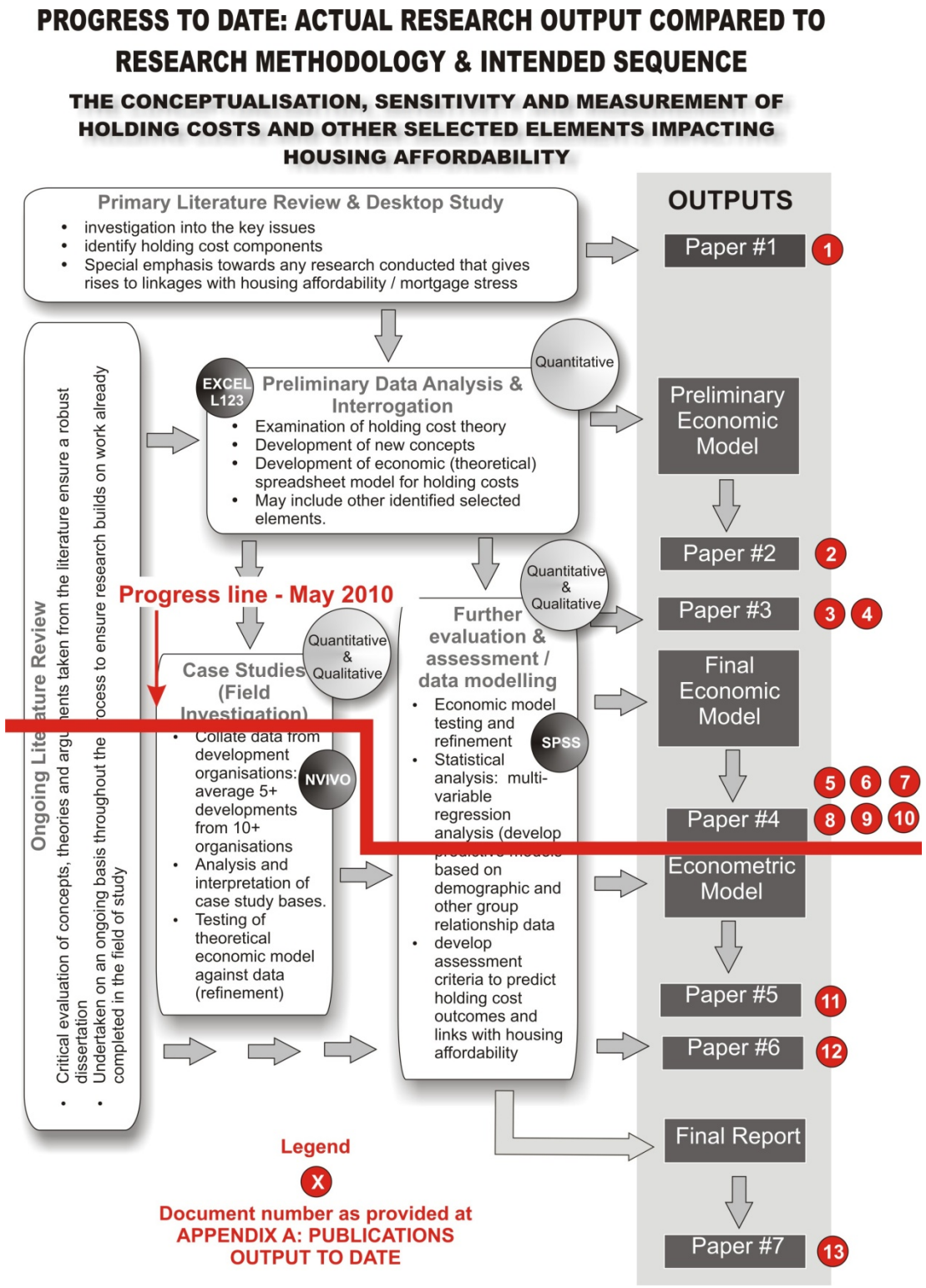


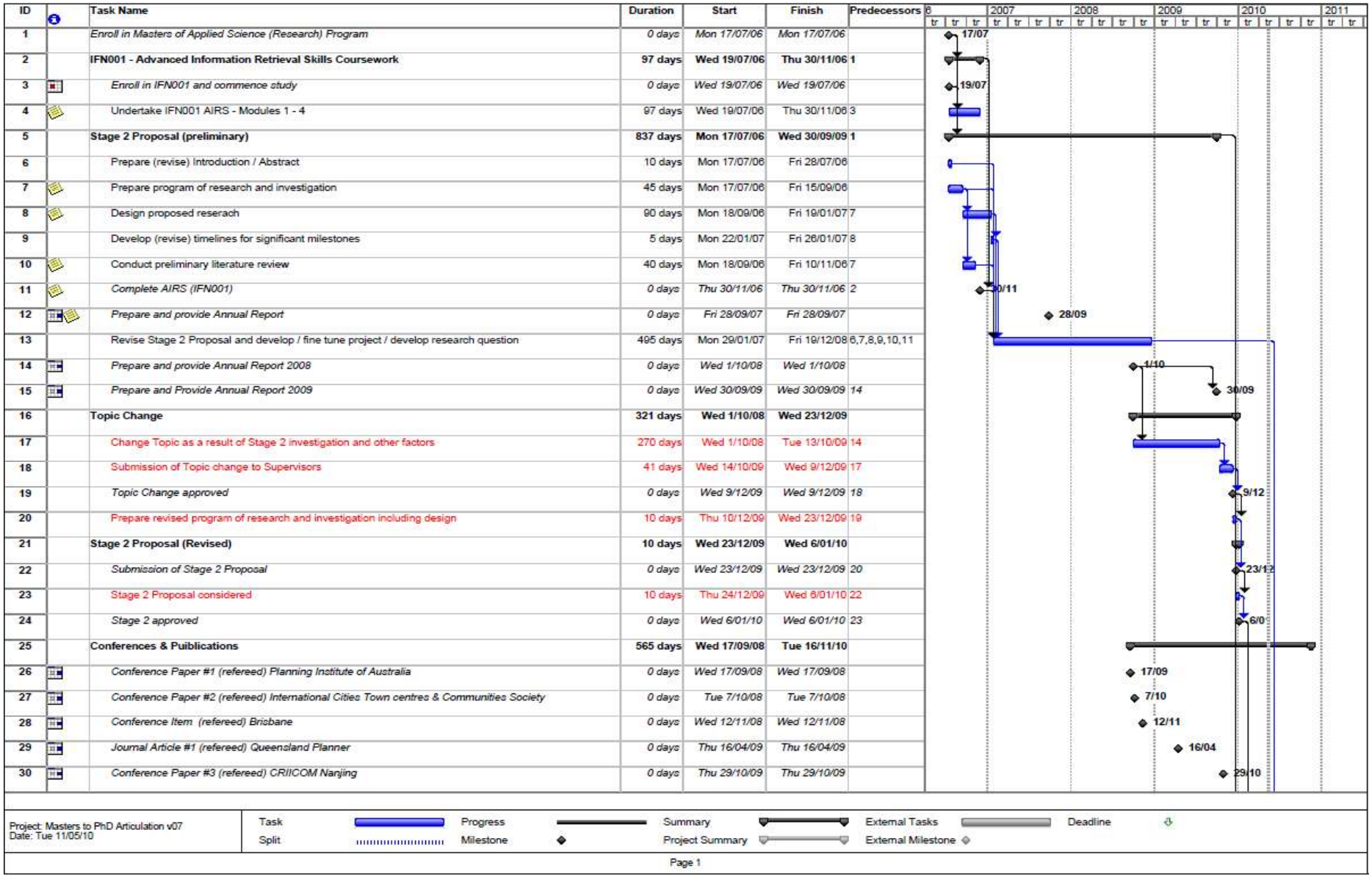
Figure 6-1 Research Output – Comparison of Research Output (Intended: Actual)

APPENDIX C: 36 TH BASE CASE HOLDING COST MODEL - ASSUMPTIONS AND OUTPUT

Table 6-2 Gross Project Holding costs: Base Case Scenario (36 months time period)

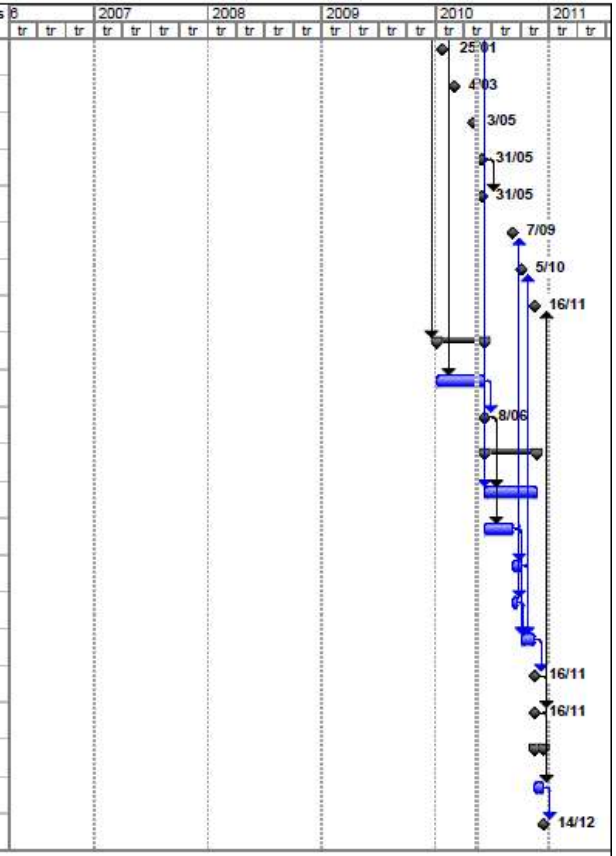
36 month "Base Case" Model				
BASE CASE SCENARIO	**Assumptions used**			**Per Lot**
Interest rate (cost)	9.00%	per annum		
Development Timing:	**Base Case**			
Identification of suitable site and site purchase	0.00	months		
Planning & Building Consents including DA	18.00	months		18
Funds raising (debt and / or equity)	3.00	months		
Construction and development	9.00	months		
Other	0.00	months		
TOTAL development time from acquisition	**30.00**	**months**		
Undeveloped Land Cost			$7,500,000	$37,500
Acquisition costs	3.00%		$225,000	$1,125
			$7,725,000	**$38,625**
Loss of Interest over a development period of	30	months	$1,857,189	$9,286
Number of lots	200			
Rates, special council charges and land tax say (% of acquisition and land costs per lot p.a.)	3.53%		$681,828	$3,409
Development Costs, say	$75,000	per lot	$15,000,000	$75,000
Interest Costs on development - based on (% of total development period)	30%			
=	9	months @ 9%	$1,001,516	$5,008
Total Development costs including interest			**$18,540,533**	**$92,703**
Total Costs of Development incl. acquisition			**$26,265,533**	**$131,328**
Developers Margin	20%	of Total costs	$5,253,107	$26,266
Sale price before selling costs			$31,518,639	$157,593
Selling Costs @	4.7%		$1,481,376	$7,407
Gross realisation			$33,000,016	**$165,000**
TOTAL HOLDING COSTS FOR PROJECT			**$2,858,705**	**$14,294**

APPENDIX D: RESEARCH TIMELINES



ID	Task Name	Duration	Start	Finish	Predecessors
1	*Enroll in Masters of Applied Science (Research) Program*	*0 days*	*Mon 17/07/06*	*Mon 17/07/06*	
2	**IFN001 - Advanced Information Retrieval Skills Coursework**	**97 days**	**Wed 19/07/06**	**Thu 30/11/06**	1
3	*Enroll in IFN001 and commence study*	*0 days*	*Wed 19/07/06*	*Wed 19/07/06*	
4	Undertake IFN001 AIRS - Modules 1 - 4	97 days	Wed 19/07/06	Thu 30/11/06	3
5	**Stage 2 Proposal (preliminary)**	**837 days**	**Mon 17/07/06**	**Wed 30/09/09**	1
6	Prepare (revise) Introduction / Abstract	10 days	Mon 17/07/06	Fri 28/07/06	
7	Prepare program of research and investigation	45 days	Mon 17/07/06	Fri 15/09/06	
8	Design proposed reserach	90 days	Mon 18/09/06	Fri 19/01/07	7
9	Develop (revise) timelines for significant milestones	5 days	Mon 22/01/07	Fri 26/01/07	8
10	Conduct preliminary literature review	40 days	Mon 18/09/06	Fri 10/11/06	7
11	*Complete AIRS (IFN001)*	*0 days*	*Thu 30/11/06*	*Thu 30/11/06*	2
12	*Prepare and provide Annual Report*	*0 days*	*Fri 28/09/07*	*Fri 28/09/07*	
13	Revise Stage 2 Proposal and develop / fine tune project / develop research question	495 days	Mon 29/01/07	Fri 19/12/08	6,7,8,9,10,11
14	*Prepare and provide Annual Report 2008*	*0 days*	*Wed 1/10/08*	*Wed 1/10/08*	
15	*Prepare and Provide Annual Report 2009*	*0 days*	*Wed 30/09/09*	*Wed 30/09/09*	14
16	**Topic Change**	**321 days**	**Wed 1/10/08**	**Wed 23/12/09**	
17	Change Topic as a result of Stage 2 investigation and other factors	270 days	Wed 1/10/08	Tue 13/10/09	14
18	Submission of Topic change to Supervisors	41 days	Wed 14/10/09	Wed 9/12/09	17
19	*Topic Change approved*	*0 days*	*Wed 9/12/09*	*Wed 9/12/09*	18
20	Prepare revised program of research and investigation including design	10 days	Thu 10/12/09	Wed 23/12/09	19
21	**Stage 2 Proposal (Revised)**	**10 days**	**Wed 23/12/09**	**Wed 6/01/10**	
22	*Submission of Stage 2 Proposal*	*0 days*	*Wed 23/12/09*	*Wed 23/12/09*	20
23	Stage 2 Proposal considered	10 days	Thu 24/12/09	Wed 6/01/10	22
24	*Stage 2 approved*	*0 days*	*Wed 6/01/10*	*Wed 6/01/10*	23
25	**Conferences & Puiblications**	**565 days**	**Wed 17/09/08**	**Tue 16/11/10**	
26	*Conference Paper #1 (refereed) Planning Institute of Australia*	*0 days*	*Wed 17/09/08*	*Wed 17/09/08*	
27	*Conference Paper #2 (refereed) International Cities Town centres & Communities Society*	*0 days*	*Tue 7/10/08*	*Tue 7/10/08*	
28	*Conference Item (refereed) Brisbane*	*0 days*	*Wed 12/11/08*	*Wed 12/11/08*	
29	*Journal Article #1 (refereed) Queensland Planner*	*0 days*	*Thu 16/04/09*	*Thu 16/04/09*	
30	*Conference Paper #3 (refereed) CRIICOM Nanjing*	*0 days*	*Thu 29/10/09*	*Thu 29/10/09*	

ID	Task Name	Duration	Start	Finish	Predecessors
31	*Conference Paper #4 (refereed) PRRES N.Z.*	*0 days*	*Mon 25/01/10*	*Mon 25/01/10*	
32	*Conference Item (refereed) SEQ Property Colloquium, Brisbane*	*0 days*	*Thu 4/03/10*	*Thu 4/03/10*	
33	*Report (unpublished) - Holding & Opportunity cost theory*	*0 days*	*Mon 3/05/10*	*Mon 3/05/10*	
34	*Journal Article #2 (refereed) Urban Economics (submitted, pending)*	*0 days*	*Mon 31/05/10*	*Mon 31/05/10*	
35	*Journal Article #3 (refereed) Journal of Urban Planning & Development (submitted, pending)*	*0 days*	*Mon 31/05/10*	*Mon 31/05/10*	*34*
36	*Journal Article #4 (refereed) Journal of Housing Economics (planned)*	*0 days*	*Tue 7/09/10*	*Tue 7/09/10*	*44*
37	*Journal Article #5 (refereed) Journal of Property Research (planned)*	*0 days*	*Tue 5/10/10*	*Tue 5/10/10*	*45*
38	*Journal Article #6 (refereed) Journal - Real Estate Economics (planned)*	*0 days*	*Tue 16/11/10*	*Tue 16/11/10*	*49*
39	**Confirmation of Candidature**	**109 days**	**Thu 7/01/10**	**Tue 8/06/10**	**5**
40	Prepare Confirmation Report (articulation to PhD) and fine tune thesis objectives	109 days	Thu 7/01/10	Tue 8/06/10	24
41	*Confirmation Seminar held*	*0 days*	*Tue 8/06/10*	*Tue 8/06/10*	*40*
42	**Project Proceeds from Confirmation**	**120 days**	**Wed 9/06/10**	**Tue 23/11/10**	
43	Ongoing literature review	120 days	Wed 9/06/10	Tue 23/11/10	13,41
44	FIELDWORK - case Study data collection / Field Investigation	65 days	Wed 9/06/10	Tue 7/09/10	41
45	Conduct preliminary analysis	20 days	Wed 8/09/10	Tue 5/10/10	44
46	Conduct statistical analysis of results obtained (MVRA)	10 days	Wed 8/09/10	Tue 21/09/10	44
47	Prepare findings and incorporate any other evidentiary links	30 days	Wed 6/10/10	Tue 16/11/10	46,44,45
48	*Final draft report completed*	*0 days*	*Tue 16/11/10*	*Tue 16/11/10*	*47*
49	*Lodgement of theseis thesis for examination*	*0 days*	*Tue 16/11/10*	*Tue 16/11/10*	*48*
50	**Final Seminar**	**20 days**	**Wed 17/11/10**	**Tue 14/12/10**	
51	Revise report as required	20 days	Wed 17/11/10	Tue 14/12/10	49
52	*Final Seminar held*	*0 days*	*Tue 14/12/10*	*Tue 14/12/10*	*51*



Project: Masters to PhD Articulation v07
Date: Tue 11/05/10

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Page 2

APPENDIX E: TIMELINES FOR THE PROPERTY DEVELOPMENT PIPELINE

Table 6-3 The Generic Greenfield Property Development Pipeline & The Impact of Time

Stage (commencing from perceived Demand Increase)	**1. Strategic identification and designation of new land release area**	**2. Gazettal of rezoning/ material change of use**	**3. Negotiation of infrastructure levies and detailed structure planning**	**4. Statutory subdivision and development approval**	**5. Major civil works, servicing of allotments and issue of new titles**	**6. Land Sale AND / OR 7. Development approvals and dwelling construction**	**8. Dwelling Completion**
Milestone	**DEVELOPER IDENTIFIES VIABLE SITE** Regulatory Constraints operate, e.g. planning, building consents, site acquisition / purchase; other constraints		**DEVELOPER RAISES EY** Market constraints impact timeframes which vary considerably (e.g. interest rates, bankers / investor attitudes, land bought forward)		**DEVELOPMENT IS CONSTRUCTED** Additional finance restructuring typically undertaken		
Time (6 years minimum, to 16 years maximum)	2–4 years	1–3 years	1–3 years	6 months – 2 years	1–2 years	6 months -2 Years OR 9–12 months	milestone
Detail	Identification of master planned area (in Qld, within defined Urban Footprint)	Rezoning under local government planning instruments is generally initiated by the proponent – time dependant on scale and complexity	Landowner/ developer undertakes the development/ structure planning process with a view to obtaining the necessary approvals – time usually depends on the quantum of government departments responsible	Issue of statutory development/subdivision approvals is the responsibility of the relevant local authority which responds to developer-initiated applications (road layouts, lot sizes and dimensions) generally on a stage-by-stage basis	Completion and certification of the construction works (undertaken by the landowner/developer) by approval agencies - subdivisions usually constructed in stages of around 50 lots - development of a large subdivision may therefore occur over a number of years.	housing design, approval and construction - may be undertaken by a lot purchaser or by a developer/builder who intends to offer a house and land package	
PIFU Residential Development Pipeline nomenclature	• Broad-hectare Land			• Lot Approval	• Operational Works • Lot production • Lot registration	• Dwelling approval	
Typical Holding Cost period incurred by developer from initial investment or commitment (4 years min. to 12 years max.)							

Adapted by the author from various sources modelled by Qld & Federal Australian Governments & Eccles (Barker, 2008; Eccles et al., 1999; *National Housing Supply Council - State of Supply Report*, 2009)

APPENDIX F: GENERIC GREENFIELD PROPERTY DEVELOPMENT PIPELINE

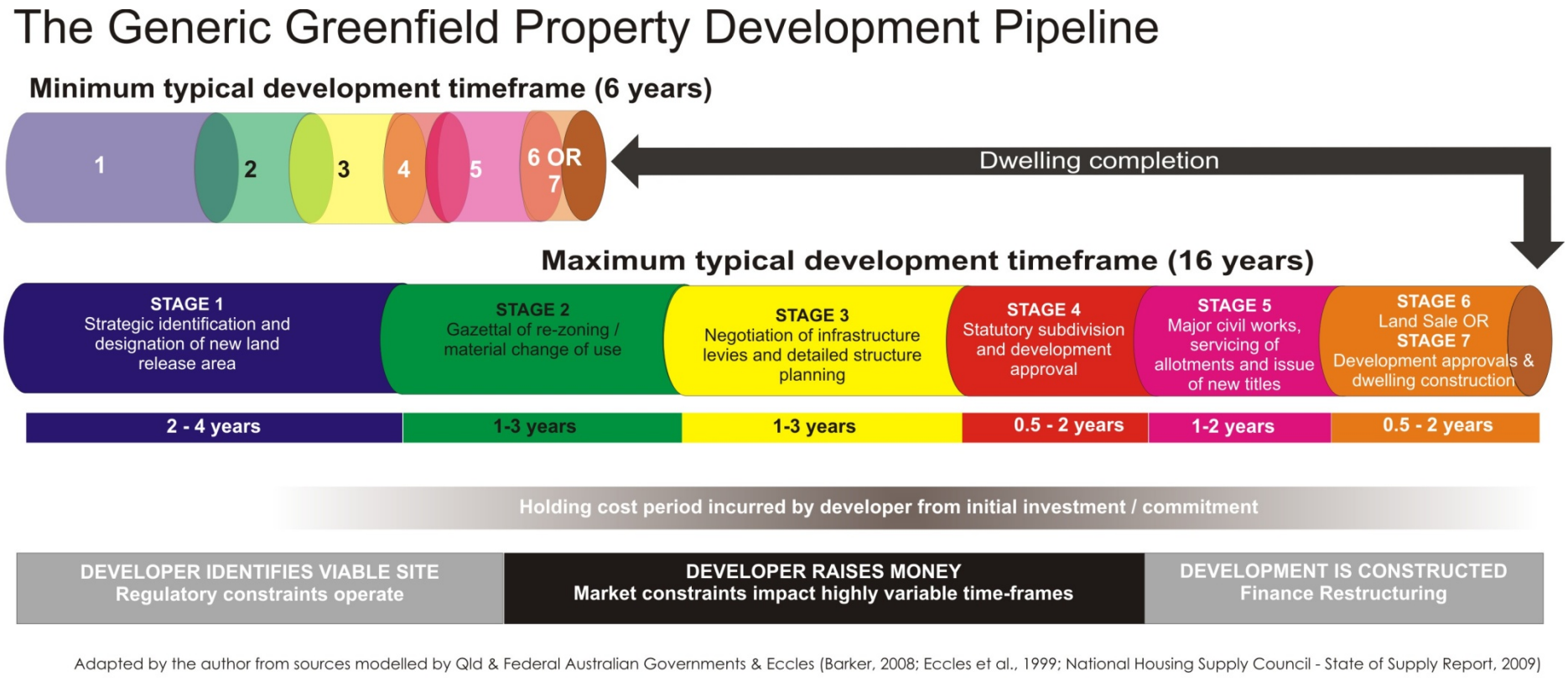


Figure 6-2 Generic Property Development Pipeline

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